4.7.16.3 Install O-ring (P/N 03373) onto inside of safety valve assembly base plate.

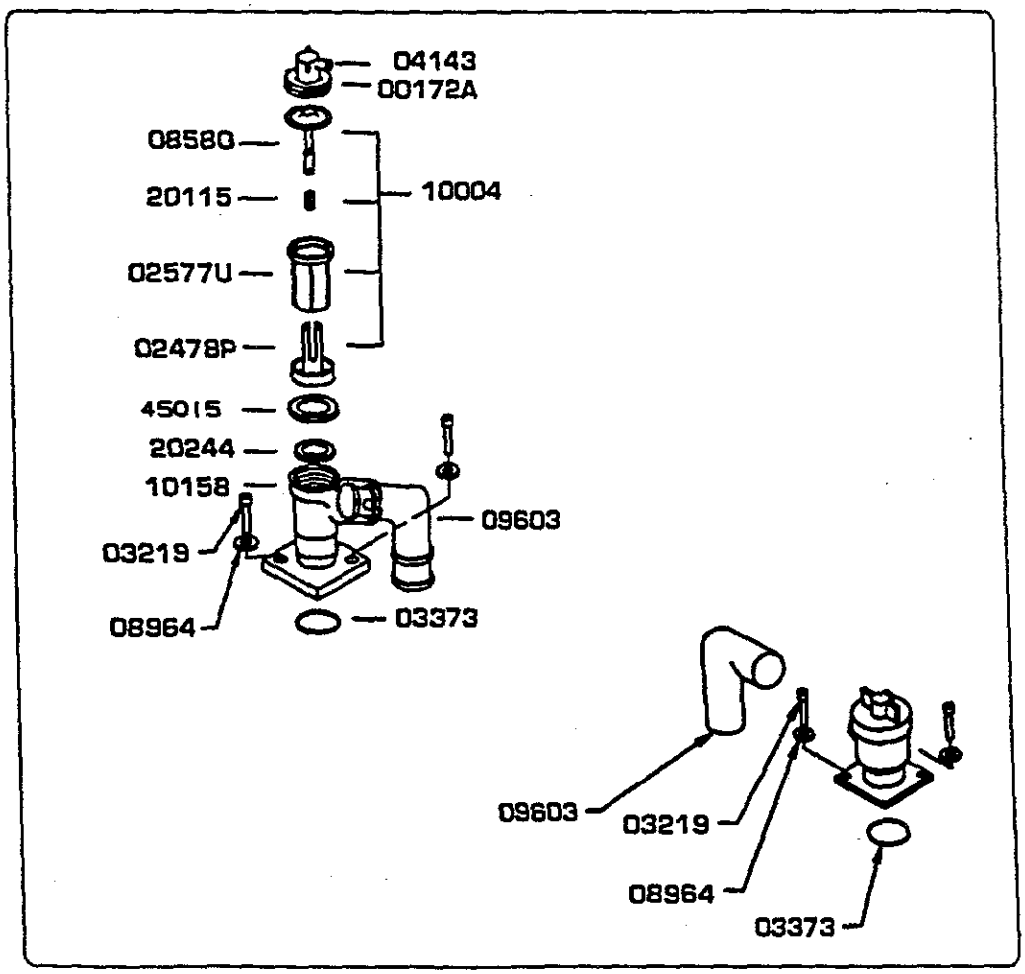
4.7.16.4 Position and secure safety valve baseplate with silicone elbow onto mounting pad on manifold casting with two screws (P/N 03219) and two (2) washers (P/N 08964) using a 7/64" Allen driver. Tighten screws evenly.

4.7.16.5 Insert end of long leg of silicone rubber elbow into remaining large hole in manifold casting until ridge makes contact with casting surface without kinking or collapsing.

4.7.16.6 Install new gasket (P/N 20244) in safety valve body. Install new cartridge assembly (P/N 10004) in safety valve body. Install and secure safety valve assembly cap (P/N 00172A).

4.7.16.7 Connect open end of regulator purge tube assembly to barbed fitting on pressure regulator.

Figure 4.7.16



4.7.17 Exhalation Valve Assembly P/N 15029

NOTE

Follow steps 4.7.17.1 - 4.7.17.4 if the unit has the Auto Zero Manifold. If the unit does not have an Auto Zero Manifold, then skip to step 4.7.17.5

4.7.17.1 Using a 3/32" Allen driver, install the Auto Zero Manifold on the rear screws on top of the exhalation valve. The two barbed fittings on the Auto Zero Manifold must face front.

4.7.17.2 Make sure when you install the Auto Zero Manifold, you place the wires through the notch cut in the plate and don't pinch the wires.

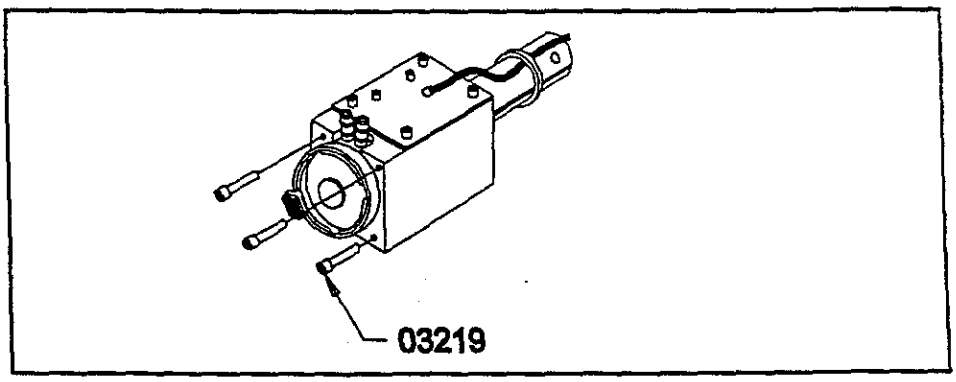
4.7.17.3 From silicone tubing P/N 40298, cut two (2) 1 1/4" pieces. Install the tubing onto the barbed fittings on the front of the Auto Zero Manifold plate.

4.7.17.4 Install tubing bracelet #10 onto the left side tube and #11 onto the right side tube.

4.7.17.5 From the inside of casting, position and insert front end of exhalation valve assembly into the large hole at the left side against the casting face.

4.7.17.6 While holding up weight of exhalation valve assembly, install and secure the two (2) 7/64" Allen screws (P/N 03219) using a 7/64" Allen driver.

Figure 4.7.17



4.7.18 Proximal Pressure Port Assembly P/N 01537

4.7.18.1 Install port fitting (P/N 01537) into the front of the casting with the threads facing inside.

4.7.18.2 Using a 7/16" open end wrench and 5/16" deep socket driver, install and secure nut (P/N 01506) onto port fitting (P/N 01537).

4.7.19 Patient Outlet Manifold Assembly P/N 10089

4.7.19.1 Install male retainer (P/N 05532) with flat side towards casting.

4.7.19.2 Install flapper gate (P/N 08881) onto the male retainer (P/N 05532).

4.7.19.3 Install female retainer (P/N 05531) with beveled side towards the flapper gate (P/N 08881).

4.7.19.4 Install O-ring (P/N 02013) onto patient outlet manifold body.

4.7.19.5 Using a $^{3}/_{32}$" Allen driver, install and secure patient outlet manifold to casting using two (2) $^{3}/_{32}$" screws (P/N 40013).

Figure 4.7.19a

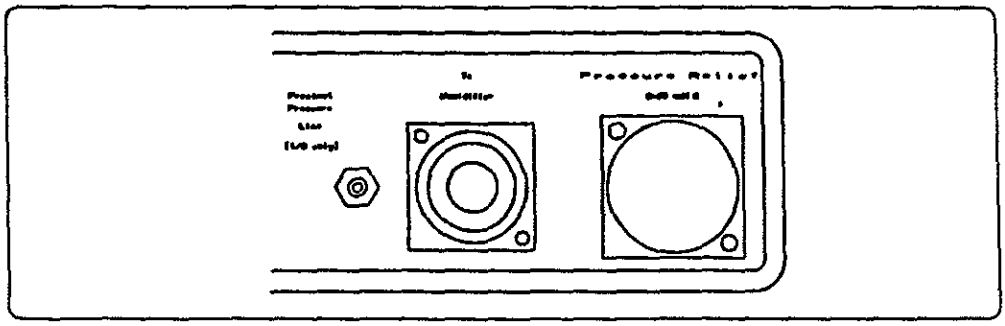
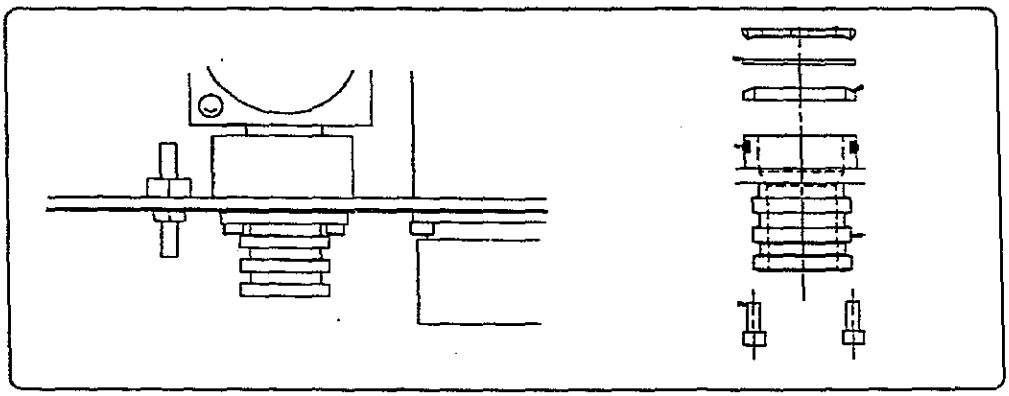


Figure 4.7.19b

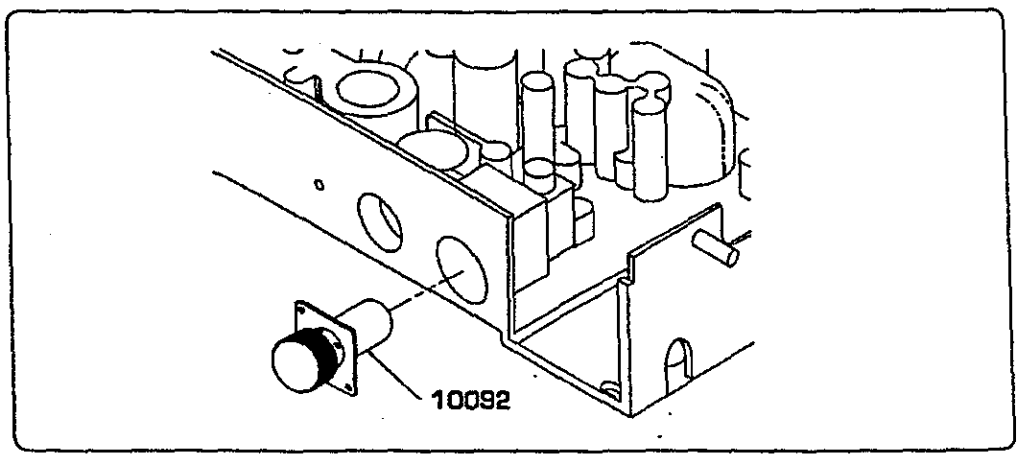


4.7.20 Pressure Relief Valve Assembly P/N 10092

4.7.20.1 Install O-rings (P/N 30006) onto pressure relief valve body.

4.7.20.2 Using a $^{7}/_{64}$" Allen driver, install and secure pressure relief valve assembly using two (2) $^{7}/_{64}$" screws (P/N 03219).

Figure 4.5.22b

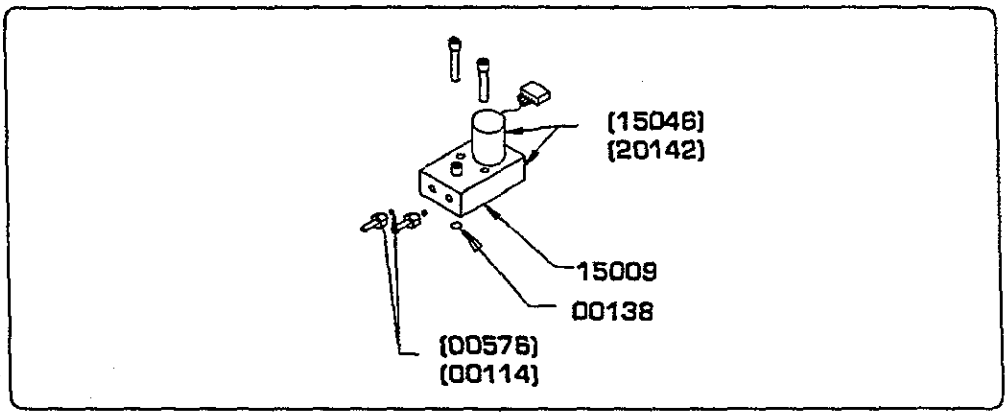


4.7.21 Jet Pump Assembly P/N 15046

4.7.21.1 Install O-ring (P/N 00138) into counterbore on base of jet pump assembly.

4.7.21.2 Using a 9/64" Allen driver install and secure jet pump assembly (P/N 15046) using two (2) screws (P/N 40015) onto the mounting pad.

Figure 4.7.21

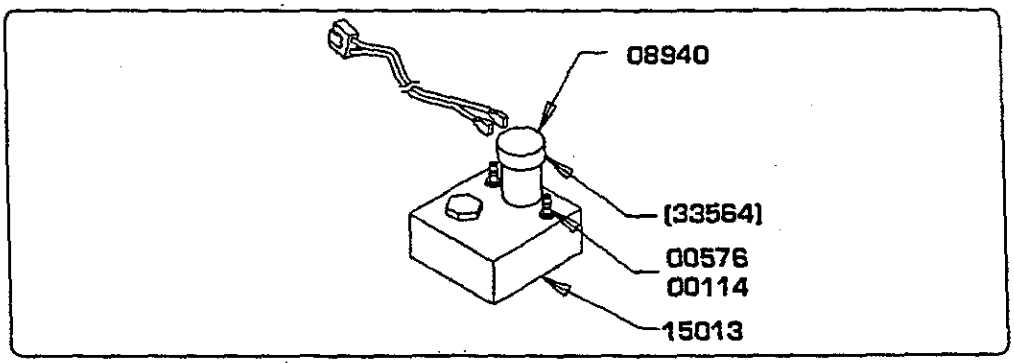


4.7.22 Safety Solenoid Assembly P/N 15013

4.7.22.1 Install O-rings (P/N 01943, 03375, and two (2) 00138) into counterbore on base of safety solenoid assembly.

4.7.22.2 Using a 9/64" Allen driver, install and secure safety solenoid assembly (P/N 15013) using two (2) screws (P/N 40012) onto the mounting pad.

Figure 4.7.22

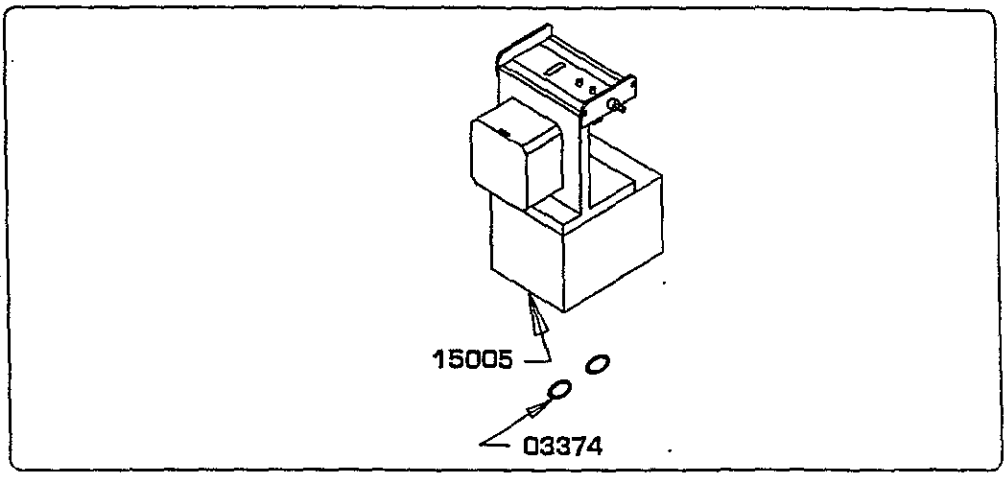


4.7.23 Flow Control Valve Asembly P/N 15005

4.7.23.1 Install two (2) O-rings (P/N 03374) into the counterbore on base of the flow control valve.

4.7.23.2 Using a 9/64" Allen driver, install and secure the flow control valve (P/N 15005) using two (2) screws (P/N 03218) onto the mounting pad.

Figure 4.7.23



4.7.24 Proximal Tube Assembly P/N 10091

4.7.24.1 Lightly lubricate O-ring (P/N 06435) and insert tee connector (P/N 06409) into safety valve cap (P/N 00172A).

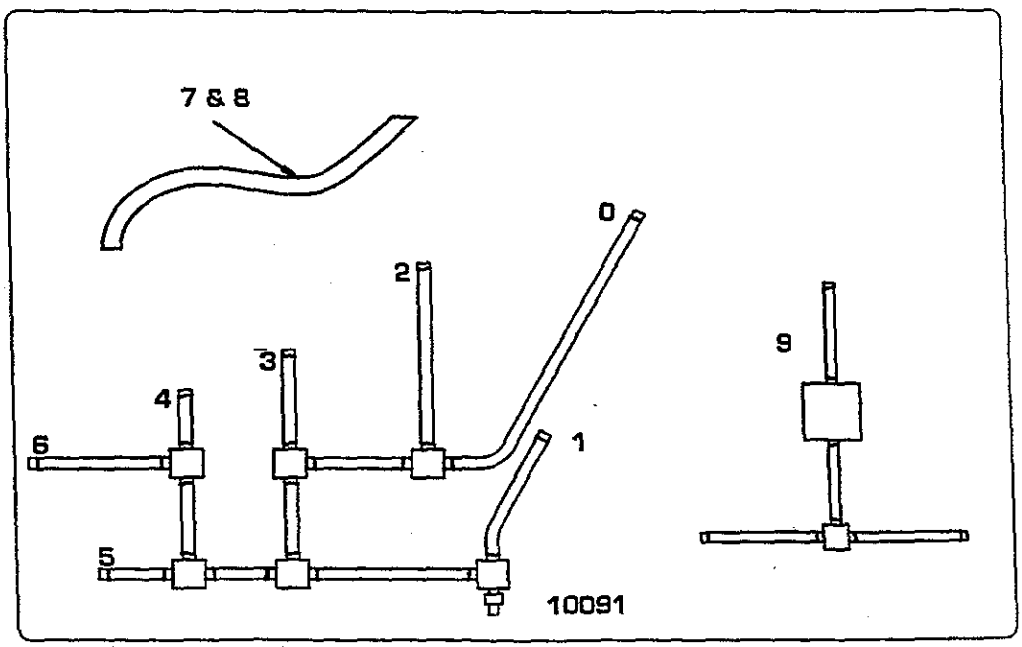
4.7.24.2 Install tube #1 to the barb connector (P/N 00576) on the left side on the safety solenoid block (P/N 15013).

4.7.24.3 Install tube #2 to the proximal pressure port fitting (P/N 01537).

4.7.24.4 Install tube #4 to the exhalation valve (P/N 15029) barb connector on the right side.

4.7.24.5 Install tube #5 to the barb connector (P/N 00576) just in front of the purge valve assembly (P/N 10180).

Figure 4.7.24



4.7.24.6 Install tube #7 to the barb connector (P/N 04555) on the right side of the jet pump assembly (P/N 15009). Install the other end of tube #7 to the exhalation valve (P/N 15029) barb connector on left side.

4.7.24.7 Install tube #8 to the barb connector (P/N 00576) on the mounting pad inlet to the pressure relief valve (P/N 10092).

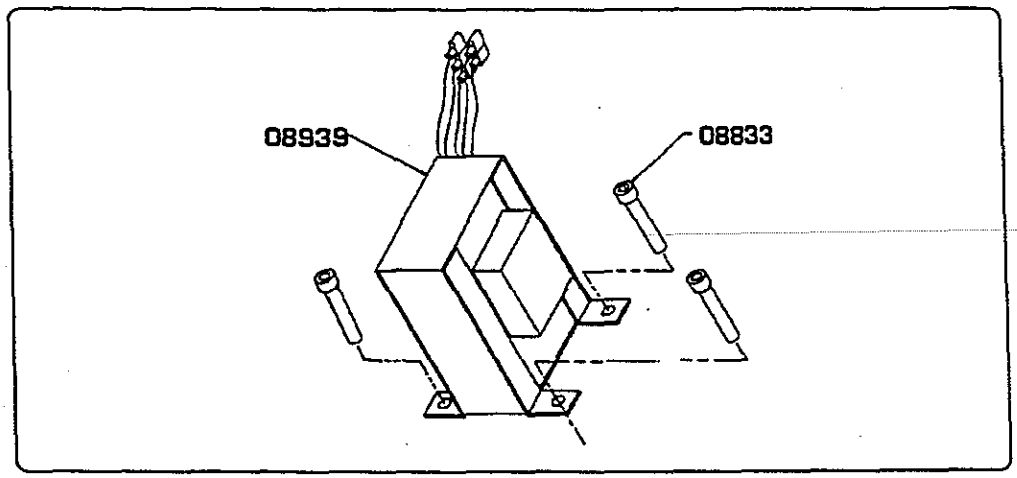
4.7.24.8 Install tube #9 to the barb connector (P/N 00576) on the right side of the safety solenoid assembly (P/N 15013). Install the longest end of tube #9 to the barb connector (P/N 00576) that is located just behind the pressure regulator (P/N 09712).

NOTE ✍ All other free tubes will be connected at a later time.

4.7.25 Power Transformer Assembly P/N 15114

4.7.25.1 Place power transformer on the four (4) stand off mounting pads with multi-colored primary wires facing towards the rear of the casting.

4.7.25.2 Using a $^{9}/_{64}$" Allen driver, install and secure the transformer using four (4) screws (P/N 08833).



4.7.26 Blender Assembly P/N 10160

4.7.26.1 Apply a small amount of teflon type to the two (2) 90° elbow connectors (P/N 33521).

4.7.26.2 Using a $^{7}/_{16}$" open end wrench, install and secure one (1) of the 90° elbow connectors (P/N 33521) to the blender inlet block.

4.7.26.3 Secure one (1) 90° elbow connector (P/N 33521) to the air inlet of the blender so that the barbed end is at the twelve o'clock position.

4.7.26.4 Using a 7/16" open end wrench, install and secure the last 90° elbow connector (P/N 33521) to the outport located on the left hand side facing the blender.

4.7.26.5 Secure the 90° elbow connector (P/N 33521) at a ten o'clock position.

4.7.26.6 Using a 7/16" open end wrench install and secure the 90° oxygen connector assembly (P/N 00086, 00087) so that it is at the twelve o'clock position.

4.7.26.7 Install all the two (2) pressure hoses to the two (2) 90° elbow connectors (P/N 33521) on the blender (P/N 10160).

4.7.26.8 Using a 1/4" nut driver, install a secure two (2) hose clamps (P/N 09787) to the pressure hoses on the blender (P/N 10160).

4.7.26.9 Position casting on its back to expose base sealing plate.

NOTE ✍

Hold blender in your hand to support its weight during installation.

4.7.26.10 Using a 1/8" Allen driver, install and secure two (2) screws (P/N 01432) into bottom of blender through the casting.

4.7.26.11 Install the two (2) hose clamps to the blender hoses. Connect hoses to the following connectors:

4.7.26.12 Outlet hose on left side of blender to the inlet elbow (P/N 33615) on the accumulator.

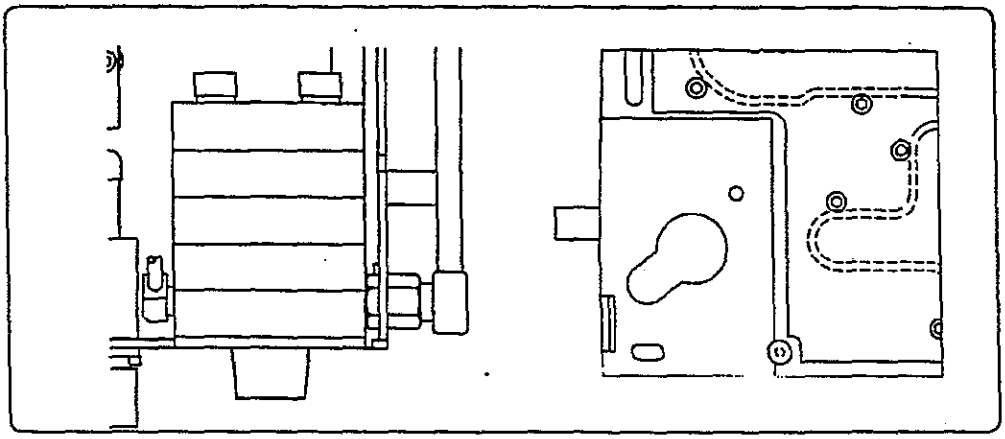
4.7.26.13 Using a 5/8" open end wrench, install and secure oxygen hose (P/N 10197) to the 90° inlet connector assembly (P/N 00086, 00087)

4.7.26.14 Using a 5/8" open end wrench, install and secure oxygen hose (P/N 10197) to the outlet connector (P/N 00610) of the inlet block assembly (P/N 33519).

4.7.26.14 Inlet hose on back left side of blender to the outlet connector marked air on the inlet block assembly (P/N 33519).

4.7.26.15 Using a 1/4" nut driver, secure the hose clamps (P/N 09787) to the two (2) hoses just installed.

Figure 4.7.26



4.7.27 **Rear Panel Assembly P/N 15004**

4.7.27.1 Using a 7/16" open end wrench or 7/16" deep socket install and secure the transformer ground wire to the ground wire to the ground lug located on the inside of the rear panel.

4.7.27.2 Position rear panel to the casting and inlet block (P/N 33519).

4.7.27.3 Connect power transformer primary wire terminals to their corresponding male terminals on the Power Entry Module (P/N 15085).

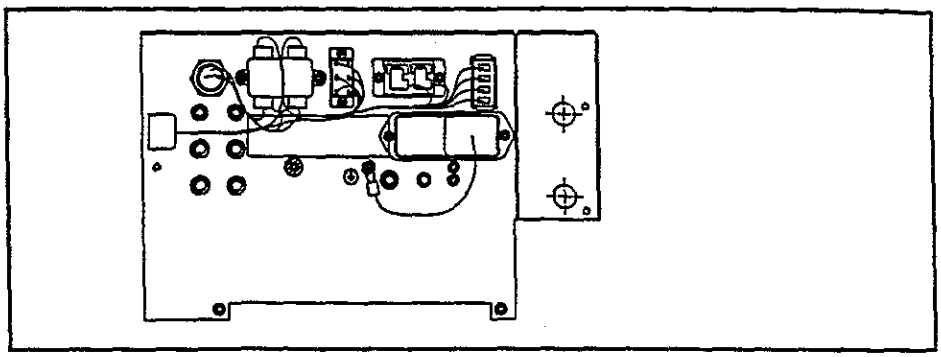
4.7.27.4 Using a 7/64" Allen driver install and secure two (2) screws (P/N 03219) through the rear panel and into the inlet block assembly (P/N 33519).

4.7.27.5 Install and secure the two (2) fiber optic cables (P/N 15016 and 15126) to the rear panel on the left side inside the unit as follows:

4.7.27.6 Screw the fiber optic cable (P/N 15016) that has the blue end to the right side.

4.7.27.7 Screw the fiber optic cable (P/N 15126) that has the grey end to the left side.

Figure 4.7.27



4.7.28 Power Board P.C.B.A. P/N 50070 or P/N 50160 (see Figure 4.5.9 on page 4-19 for P/N 50070 diagram)

4.7.28.1 Install the three (3) securing screws (P/N 08883) to the power board mounting pad approximately one full turn clockwise (CW).

4.7.28.2 Place the power board assembly onto the mounting pad.

4.7.28.3 Install the one (1) 7/64" securing screw (P/N 03219) through the rear panel (P/N 15004) and secure to the power board bracket (P/N 20174R).

4.7.28.4 Using a 9/64" Allen driver secure the three (3) screws (P/N 08883) to the power board assembly.

4.7.28.5 Connect the transformer (P/N 15114) 3 pin molex connector to J9 on the power board.

4.7.28.6 Connect eight (8) pin molex connector to the J8 on power board.

4.7.28.7 Connect safety solenoid (P/N 15120) two (2) pin molex connector to the J303 on power board.

NOTE

If the unit has an auto zero manifold the J301 connector is a two part connector. The Jet Pump is a two pin connector (blue) and goes to the upper two pins on the J301 plug on the Power Supply PCB. Auto Zero Manifold three pin connector (red) goes to the lower three pins on the J301 plug on the Power Supply PCB.

4.7.28.8 Connect jet pump (P/N 15046) five (5) pin connector to J301 on the power board.

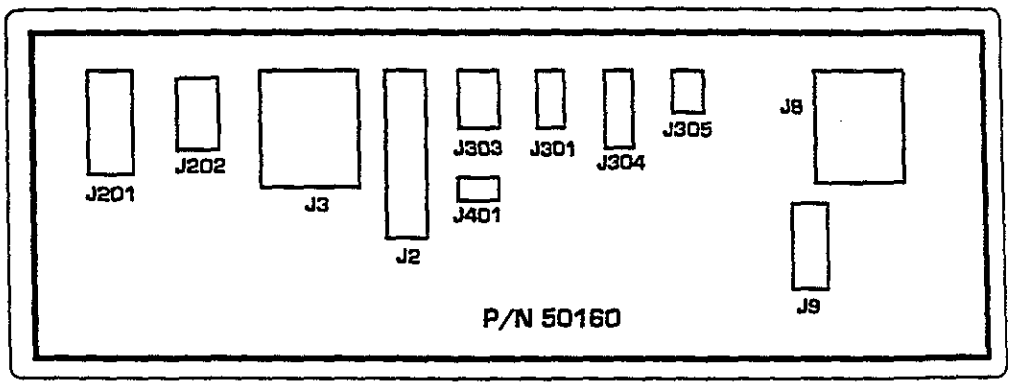
4.7.28.9 Connect data twenty-six pin ribbon cable (P/N 15043) to J2 on the power board.

4.7.28.10 Connect power ten (10) pin molex connector assembly (P/N 15039) to J3 to the power board.

4.7.28.11 Connect exhalation control valve (P/N 15029) twelve (12) pin connector to J202 on the power board.

4.7.28.12 Connect flow control valve (P/N 15005) fourteen (14) pin connector to J201 on the power board.

Figure 4.7.28



4.7.29 Manometer Assembly P/N 09799

4.7.29.1 Install manometer against rear surface of front panel (P/N 20120).

4.7.29.2 Using the two (2) bracket (P/N 09639) with long leg of bracket retaining manometer lip, secure manometer in place with two (2) securing screws (P/N 03219) using a $^{7}/_{64}$" Allen driver.

4.7.30 Display And Main P.C.B.A Display P/N 50040 or P/N 50250 and Main P/N 50050 or P/N 50260

4.7.30.1 Carefully place display main P.C.B.A. onto the rear surface of the front panel (P/N 20120).

4.7.30.2 Using a $^{7}/_{64}$" Allen driver, secure loosely the eight (8) screws (P/N 03221) through the display main P.C.B.A.

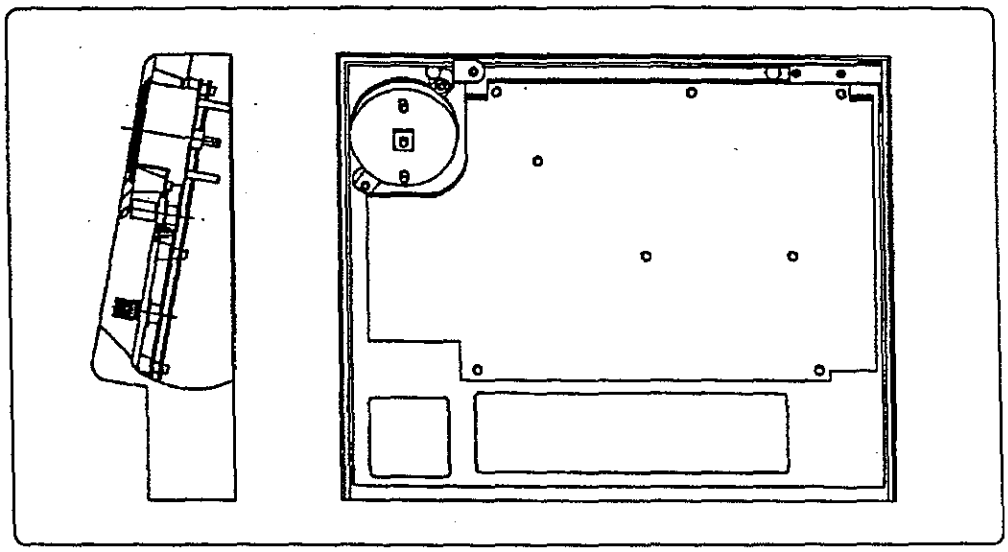
4.7.30.3 Using a $^{5}/_{16}$" nut driver, install and secure the eleven (11) locking nuts (P/N 03281) starting with the mode selector.

4.7.30.4 Install the ten (10) friction bushings (P/N 09780) starting with the tidal volume control and ending with the low peak pressure control.

4.7.30.5 Secure only finger tight the ten (10) friction bushings.

4.7.30.6 Using $^{7}/_{64}$" Allen driver, do the final tightening of the eight (8) screws (P/N 03221) ten securing the display main P.C.B.A. to the front panel.

Figure 4.7.29 and 4.7.30



4.7.31 Front Panel Assembly P/N 15008

4.7.31.1 Place unit on its rear panel so the sealing plate is exposed.

4.7.31.2 Carefully slide the front panel onto the unit.

4.7.31.3 Using a $^{9}/_{64}$" Allen driver, secure the front panel with two (2) screws (P/N 08833).

4.7.31.4 Using a $^{7}/_{64}$" Allen driver, secure the two (2) bumper feet (P/N 33524) to the bottom of the front panel.

4.7.31.5 Position unit so that the front panel is facing you.

4.7.31.6 Install all eleven (11) control knobs onto the controls, beginning with the mode selector.

4.7.31.7 Position unit so that the rear panel is facing you.

4.7.31.8 Connect the fiber optic cables to the display main P.C.B.A. as follows:

a) The fiber optic cable with gray end to U701.

b) The fiber optic cable with blue end to U713.

CAUTION ✔

To avoid damaging the four (4) transducers on the Display Main P.C.B.A., extreme care should be taken when connecting the tube assemblies. The proper method for connecting these tube assemblies is to push them firmly straight forward avoiding applying side load to the transducers.

4.7.31.9 Connect the four remaining tube assemblies as follows:

a) Number six (6) tube to the Transducer marked **EXHL.**

b) Number three (3) tube to the Transducer marked **PROX.**

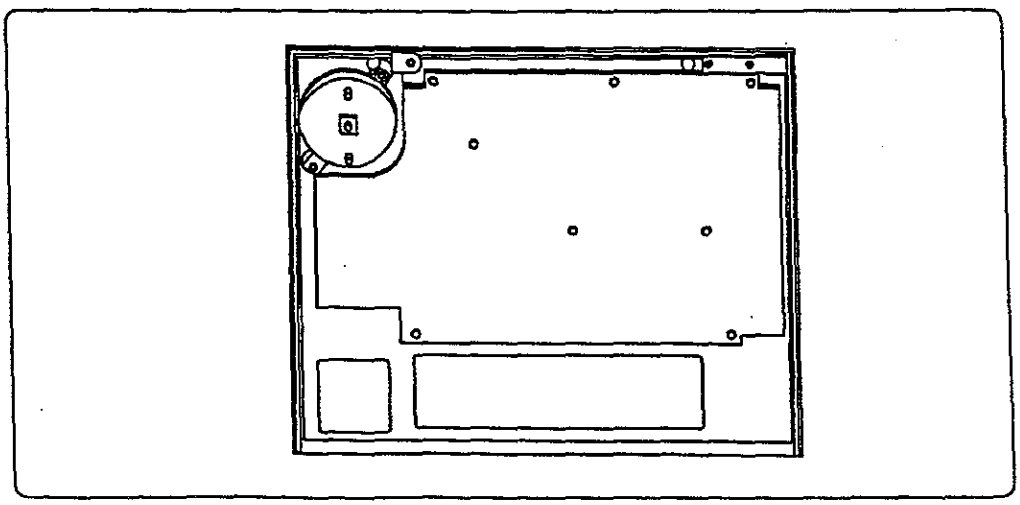
c) Number nine (9) tube to the Transducer marked **GAS.**

d) Number eight (8) tube to the Transducer marked **MACH.**

4.7.31.10 Connect power ten (10) pin molex connector assembly (P/N 15039) to J3 on the Display/ Main P.C.B.A.

4.7.31.11 Connect data twenty-six (26) pin ribbon cable (P/N 15043) to J2 on the Display Main P.C.B.A.

Figure 4.7.31



4.7.32 Auxiliary Outlet Assembly P/N 20221

4.7.32.1 Position unit so that it is facing you.

4.7.32.2 Using a thin needle nose pliers, install the poppet spring (P/N 03810) into the outlet port of the blender.

4.7.32.3 Install two (2) O-rings (P/N 03810) into the outlet port of the blender.

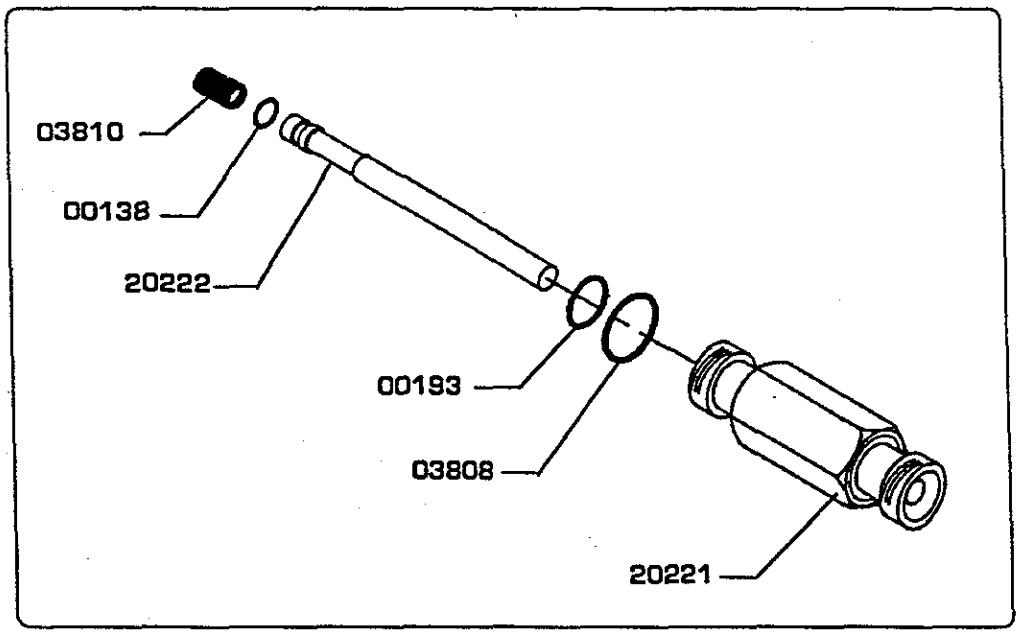
4.7.32.4 Install two (2) O-rings (P/N 00193 and 03808) onto the auxiliary outlet body (P/N 03809).

4.7.32.5 Install one (1) O-ring (P/N 00138) onto the poppet (P/N 20222).

4.7.32.6 Install poppet (P/N 20222) into the auxiliary outlet body (P/N 03809).

4.7.32.7 Using a $^{11}/_{16}$" open end wrench, install and secure auxiliary outlet (P/N 20221) to the blender.

Figure 4.7.32



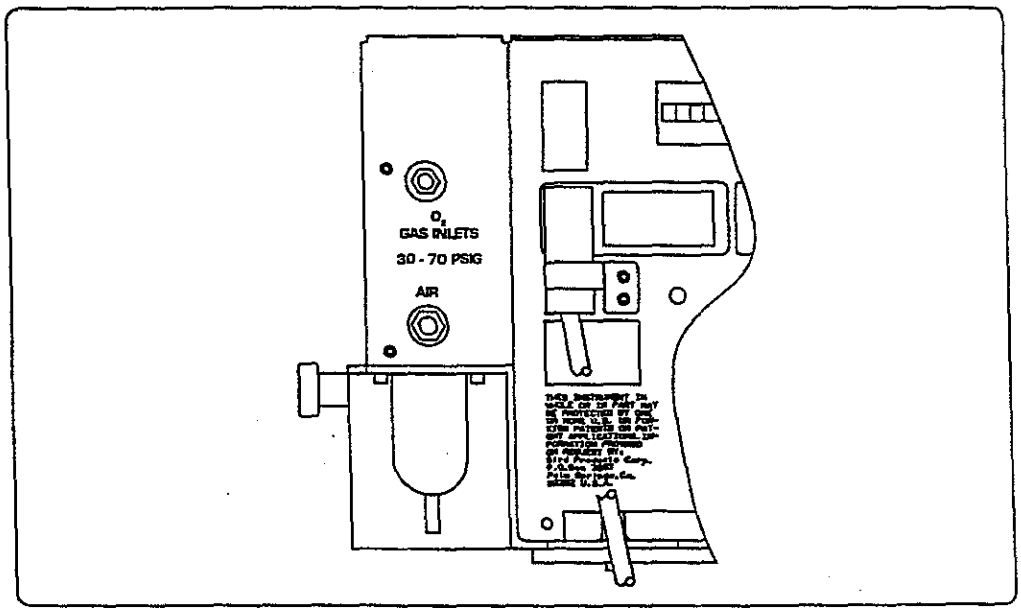
4.7.33 Power Cord Assembly P/N 08925

4.7.33.1 Attach the female end of the power cord to the three (3) pin socket in the power entry module.

4.7.33.2 Using $^{9}/_{64}$" Allen driver, secure the power cord clamp (P/N 06148) using two (2) screws (P/N 04381).

Unit is now ready for the following Operational Verification Procedure.

Figure 4.7.33



4.8 OPERATIONAL VERIFICATION PROCEDURES

This section is divided as follows:

4.8.1 Required Equipment

4.8.2 Preparation

4.8.3 Operational Verification Procedures

4.8.4 Post Verification

4.8.5 Vent Inop Codes

A numbering system is utilized so that one can easily identify the steps involved with each major operation.

Pre-Calibration

Complete each step in the sequence outlined to obtain the required calibration parameters.

If the required parameters are not met, refer to the troubleshooting instructions.

4.8.1 Required Equipment:

Endotracheal tube, 5.0mm, I.D. x 12.5" (31.75cm)long
Standard test lung required compliance 10 ml/cmH_2O ± 5%. A 2.5 gallon rigged container filled with 11 pounds (5 kg) of fine copper wool or equivalent.
Stop watch
Digital Voltmeter
Calibrated Oxygen Analyzer (analyzer should read in tenths to ensure accuracy of calibration)
Precision Pressure Manometer 0 -30 PSIG (with accuracy of +.05 and -.2 PSIG increments) (0 - 2.1 kg cm^2)
Flow Tube 0 - 1 LPM (in increments of .1 LPM)
Digital Thermometer 50/120°F (9° ± 48°C) ± 2°F (-15°C)
Digital Pressure Transducer -20/+140 cmH_2O with accuracy of +.5 a/t 0 cmH_2O to + cmH_2O at full scale
Variable Transformer 1 - 140 volts or 1 - 260 volts
12 - 15 VDC Power Supply with 5 AMP minimum
4 Function Calculator (must have square root/memory)
Anti-Static Mats for Table and Floor, wrist strap, Anti-Static D.I.P. Remove for (EPROMS and IC's) Anti-Static Bags
8 Liter Volume Spirometer ± 2% accuracy (or its equivalent)
P/N 03210 BHH Heating Module
P/N 10134 Patient Circuit PED
P/N 00077 Inline Pressure Manometer

Required Equipment\Continued

P/N 00673 Flowmeter Adapter
P/N 00680 Tapered Nipple
P/N 00822 Hex nut
P/N 01233 22mm Male x 15mm Female, 2 each
P/N 02187 22mm Female x 22mm Male x 15mm Female, 2 each
P/N 09220 Bird Flowmeter 0 -15 LPM
Allen Hex Ball End 7" (18cm) Shank Drivers 3/32"
Trimpot Adjuster
P/N 15137 Current Measuring Test Fixture
P/N 15205 Fiber Optic Test Loop
P/N 03389 Pressure Test Harness
P/N 10269 Tee Test Harness

4.8.2 Preparation

4.8.2.1 Attach anti-static strap to wrist.

4.8.2.2 Place ventilator on work table or mount to the stand (P/N 04820) as described in Section 2.0, 2.2, steps two (2) and three (3).

4.8.2.3 Install exhalation diaphragm and exhalation valve housing.

NOTE ✍ Inspect housing O-rings (P/N 20117) for wear and/or splitting.

4.8.2.4 Exhalation valve housing is properly installed when locking tab on exhalation valve clicks and springs forward.

4.8.2.5 Connect air and oxygen supply source regulators to their respective gas sources.

Make certain that pressure regulators are turned full counter-clockwise (CCW) **OFF, CLOSED.**

4.8.2.6 Open and adjust air supply source regulator and check for water contents.

4.8.2.7 Turn air supply source regulator to full counter-clockwise (CCW) **OFF, CLOSED.**

4.8.2.8 Connect Oxygen supply hose and air supply hose from their respective supply source regulators to their corresponding connections on the ventilator DISS inlet connectors.

4.8.2.9 Set oxygen concentration selection knob of blender to 60%.

4.8.10 Attach and secure 0-100 PSIG (0-1.03kg cm^2) inline pressure manometer (P/N 00077) to the auxiliary outlet of the blender.

4.8.2.11 Attach and secure 0-15 LPM flowmeter (P/N 09226) to the inline pressure manometer (P/N 00077).

NOTE

Make sure flowmeter control knob is turned full clockwise (CW) **OFF, CLOSED.**

4.8.2.12 Turn supply source regulators clockwise (CW) and adjust supply source to ventilator to 50 PSIG (3.5 kg cm^2).

4.8.2.13 Set ventilator **ON/OFF** (I/O) circuit breaker to **OFF** position (0) on rear panel.

4.8.2.14 Insert male end of power cord (P/N 08925) into the proper grounded voltage receptacle.

4.8.2.15 Proceed with Operational Verification Procedures.

4.8.3 Operational Verification Procedures

4.8.3.1 Locate DIP switch on the main board at SW504. This is the eight (8) switch DIP switch.

4.8.3.2 Set switch #4, #5 and #8 to the **ON** position. If the unit has Auto Zero, set switch #6 and #7 to the **OFF** position.

4.8.3.3 Turn the circuit breaker **ON/OFF** switch to **ON** (I).

4.8.3.4 Set switch #1, #2, #3, #6, and #7 to the **OFF** position; switch #5 to the **ON** position.

4.8.3.5 The unit is now set for the SDT mode (Service Diagnostics Test).

4.8.3.6 The Monitor Display will flash the message: **"CAUTION REMOVE PATIENT PRESS SELECT".**

4.8.3.7 Before pressing the Select button, be sure that patient circuit is not connected to the test lung.

4.8.3.8 Press Select button: the monitor display will read "Soft Rev" (Software Revision).

4.8.3.9 Press Manual Breath button: the monitor display will read "A:" followed by five (5) numbers. This will represent the software revision that is being used in the ventilator for the Main board.

"A:xx.xxx"

4.8.3.10 Press Select button: the monitor display will read "B:" followed by five (5) numbers. This will represent the software revision that is being used in the ventilator for the Power Board.

"B:xx.xxx"

4.8.3.11 Press Select button: the monitor display will read "C:" followed by five (5) numbers. This will represent the software revision that is being used in the ventilator for the Display board.

"C:xx.xxx"

4.8.3.12 Press Select button: the monitor display will read "P:" followed by five (5) numbers. This will represent the software revision that is being used in the ventilator for the watch dog timer or (PAL).

"P:xx.xxx"

4.8.3.13 Press Select button: the monitor display will read "LANG TST" (LANGUAGE TEST).

4.8.3.15 Press Manual Breath button: the monitor display will read the user selected language. At this time, all languages can be checked by setting the proper DIP switch code on the

four (4) switch language DIP switch located on the main board at SW503. The codes are as follows:

- ENGLISH all DIP switches to **OFF** position.
- GERMAN (Deutsche) DIP switches #1 and #2 **ON**, #3 and #4 **OFF**.
- FRENCH (Francais) DIP switches #1 and #3 **ON**, #2 AND #4 **OFF**.
- SPANISH (Espanol) DIP switches #2 and #3 **ON**, #1 AND #4 **OFF**.
- JAPANESE all DIP switches to **ON**.

4.8.3.16 Press Select button: The monitor display will read "APNE TEST" (Apnea Test).

4.8.3.17 Press Manual breath button: the monitor display will read the user selected apnea interval. This is preset at the factory for 20 seconds. At this time, all apnea intervals can be checked by setting the proper codes on the eight (8) switch DIP switch located on the main board at SW504. The Apnea Interval codes are as follows:

a) 20 seconds: DIP switches #1, #2 and #3 are in the **OFF** position.

b) 40 seconds: DIP switches #1 and #2 are in the **ON** position, #3 is in the **OFF** position.

c) 60 seconds: DIP switches #1 and #3 are in the **ON** position and #2 is in the **OFF** position.

4.8.3.18 Press the Select button: Monitor display will read "LAMP TST" (Lamp Test).

4.8.3.19 Press Manual breath button: All seven-segment displays and discrete LED's will light up with the exception of the VENT INOP, LED, and the EXTERNAL D.C. LED.

4.8.3.20 Press Select button: this will execute the second LAMP TST. The second test operates by lighting a single segment in each of the seven segment displays. Then sequencing

the lighted segment through each of the segments in a display. This allows the users to ensure that no two segments are shorted to each other. If two segments were shorted, they would either be ON or Off in a single display.

4.8.3.21 Press Select button: the monitor display will read "CTRL TST" (Control Test).

Verify the operation of the push button controls. Press Manual Breath: Monitor Display will read "BREATH".

Press Silence button: Monitor Display will read "SILENCE".

Press Reset button: Display will read "RESET".

Verify the operation of the mode selector to Time cycled IMV/CPAP: Monitor Display will read "TIME IMV".

Mode selector to Volume Cycled Assist/Control: Monitor Display will read "VOL/A/C".

4.8.3.22 Mode Selector to Volume Cycled SIMV/CPAP: Monitor Display will read "VOL SIMV".

4.8.3.23 Press Select button: Monitor Display will read "AUDIBLE".

4.8.3.24 Press Manual Breath button: Audible alarm will sound.

4.8.3.25 At this time, verify the loudness control function of the audible alarm.

4.8.3.26 Between the Silence and Reset buttons is the Audible Alarm adjustment.

4.8.3.27 Using a small standard driver, adjust the alarm loudness as follows:

- Minimum: full counter-clockwise (CCW)
- Maximum: full clockwise (CW)

4.8.3.28 Block Proximal port on front of ventilator and set Proximal purge needle valve to (P/N 10180) 60 $\pm$ 3cmH_2O.

NOTE

If your ventilator has an Auto Zero Manifold and the software EPROM A is revision 11.010 (10.000) or older, then do Steps 4.8.3.28a - 4.8.3.28d. If not, then skip to step 4.8.3.29

4.8.3.28a Turn your until off. Locate J301 on the Power PCB and disconnect the cable.

4.8.3.28b Remove the white header retainer from the cable connector.

4.8.3.28c Connect the Auto Zero Manifold cable (3 pin connector on top (red) see figure 4.5.9 on page 4-19) to J401 on the Power PCB. J401 is labeled "fan".

4.8.3.28d The Auto Zero Manifold connector is a 3 pin connector. There are only two wires. Make sure you align the two wires with the two pins of J401 socket on the Power PCB.

4.8.3.29 Press Select button until Monitor display will read: "XDCR CAL" (transducer calibration).

4.8.3.30 This will check the setting of the System Pressure Transducer, and calibration of the PROXIMAL, EXHALATION, and MACHINE PRESSURE TRANSDUCERS.

4.8.3.31 Press Manual button: by pressing the Select button it will advance the monitor display through the four (4) transducers. The transducer reading being displayed is indicated by the first character appearing in the Monitor display: "S" for System Pressure, "P" for Proximal Pressure, "X" for Exhalation Pressure, and "M" for Machine Pressure. (Note: System Pressure display is not to be used for setting verification. Internal voltage measurements will be used.)

4.8.3.32 Attach a digital multimeter between TP402 (positive lead) and TP101 (ground lead) on the Main PCB.

PRESSURE TABLE

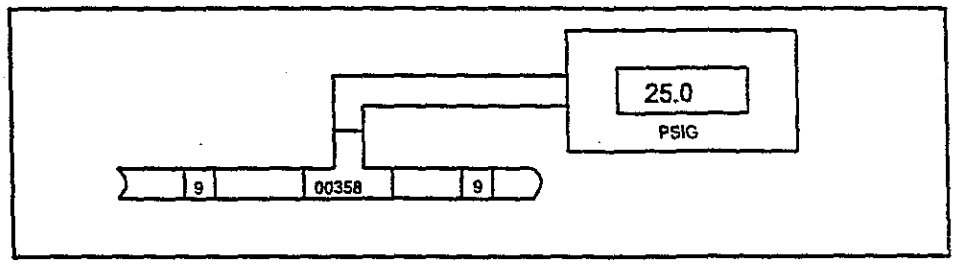
SYSTEM PRESSURE (PSIG)	NOMINAL VOLTAGE (Vdc)	SET-POINT RANGE (Vdc)
24.5	4.3125	4.2975 - 4.3275
24.6	4.325	4.315 - 4.340
24.7	4.3375	4.3225 - 4.3525
24.8	4.350	4.335 - 4.365
24.9	4.3625	4.3475 - 4.3775
25.0	4.375	4.360 - 4.490
25.1	4.3875	4.3725 - 4.4025
25.2	4.400	4.385 - 4.415
25.3	4.4125	4.3975 - 4.4275
25.4	4.425	4.410 - 4.440
25.5	4.4375	4.225 - 4.4525

4.8.3.33 If the reading on the digital multimeter is not between 4.298 and 4.45 volts, check the system pressure regulator (P/N 33566) as follows (refer to Figure 4.8.3a):

a) Connect the master manometer to the tube assembly #9 as follows.

b) Disconnect bleed tube assembly #9 at the barbed tee fitting (P/N 00358).

Figure 4.8.3a



c) Connect master manometer to barbed tee fitting (P/N 00358).

4.8.3.34 If master manometer does not read 25 PSI (1.75 kg cm2), then adjust system pressure regulator to correspond. (Refer to Section 4.7.12.)

4.8.3.35 If necessary, adjust system pressure transducer R442 (GAS) so that the reading on the digital multimeter is between 4.360 and 4.490 volts. Disconnect master manometer and reattach bleed tube.

4.8.3.36 Press Select Button: Verify Monitor Display window reads P 0.00 ±1.00 cmH2O. If transducer is in specification, skip to step 4.8.3.38.

4.8.3.37 If transducer reading is out of specification, calibrate the Proximal Transducer. Adjust the Zero Proximal Potentiometer R325 until the monitor display reads P 0.00 ±0.25 cmH2O.

4.8.3.38 Press Select Button: Verify Monitor Display window reads X 0.00 ±1.00 cmH2O. If transducer is in specification, skip to step 4.8.3.40.

4.8.3.39 If transducer reading is out of specification, calibrate the Exhalation Transducer. Adjust the Zero Exhalation Potentiometer R349 until the monitor display reads **X** 0.00 ±0.25 cmH_2O.

4.8.3.40 Press Select Button: Verify Monitor Display window reads **M** 0.00 ±2.00 cmH_2O. If transducer is in specification, skip to step **4.8.3.42.**

4.8.3.41 If transducer reading is out of specification, calibrate the Machine Transducer. Adjust the Zero Machine Potentiometer R337 until the monitor display reads **M** 0.00 ±0.25 cmH_2O.

4.8.3.42 Press Manual Breath Button: Monitor display will read **S** XX.X PSI.

4.8.3.43 Press Select Button: Monitor display will read **P** 0.00.

4.8.3.44 Attach Pressure Test Harness (P/N 03389) to the flow meter as shown in **Figure 4.8.3b.**

4.8.3.45 Connect the three (3) tubes of the Pressure Test Harness (P/N 10269) to the three (3) Transducers: Proximal PT301, Machine PT302, Exhalation PT303. Tee in the Master Manometer (Valadyne or equivalent), as shown in **Figure 4.8.3b.**

4.8.3.46 Slowly open and adjust flow meter until Master Manometer reads 50.00 cmH_2O ±0.25 cmH_2O.

4.8.3.47 Verify the Monitor Display window and Master Manometer read **P** 50.00 ±1.00 cmH_2O. If the transducer is in specification, skip to step **4.8.3.49.**

4.8.3.48 If transducer reading is out of specification, calibrate the Proximal Transducer. Adjust the Span Proximal Potentiometer until both the Monitor Display window and Master Manometer R318 read 50.00 ±0.25 cmH_2O.

4.8.3.49 Verify the Monitor Display window and Master Manometer reads **X** 50.00 ±1.00 cmH_2O. If the transducer is in specification, skip to step **4.8.3.51.**

4.8.3.50 If transducer reading is out of specification, calibrate the Exhalation Transducer. Adjust the Span Exhalation Potentiometer R342 until both the Monitor Display window and Master Manometer read 50.00 ±0.25 cmH_2O.

4.8.3.51 Verify the Monitor Display window and Master Manometer read **M** 50.00 ±2.00 cmH_2O. If the transducer is in specification, skip to step **4.8.3.53.**

4.8.3.52 If transducer reading is out of specification, calibrate the Machine Transducer. Adjust the Span Machine Potentiometer R330 until both the Monitor Display window and Master Manometer read 50.00 ±0.25 cmH_2O.

Summary of Transducer Settings

CALIBRATING SPECIFICATION	TRANSDUCER	OPERATING SPECIFICATION
0.0 ±0.25 cmH_2O	Proximal Zero	0.0 ±1.0 cmH_2O
0.0 ±0.25 cmH_2O	Exhalation Zero	0.0 ±1.0 cmH_2O
0.0 ±0.25 cmH_2O	Machine Zero	0.0 ±2.0 cmH_2O
50.0 ±0.25 cmH_2O	Proximal Span	50.0 ±1.0 cmH_2O
50.0 ±0.25 cmH_2O	Exhalation Span	50.0 ±1.0 cmH_2O
50.0 ±0.25 cmH_2O	Machine Span	50.0 ±2.0 cmH_2O

4.8.3.53 Press Select Button: Monitor Display will read "FIBER TST" (Fiber Optic Link Test).

4.8.3.54 Connect Fiber Optic Test cable (P/N 15205) to the data A port (IN) and to the data B port (OUT). Set Mode Selector to SIMV/CPAP. Set ASSIST SENSITIVITY and PRESSURE SUPPORT to OFF.

4.8.3.55 Press Manual Breath button: This test will check the integrity of the fiber optic link system and will run approximately 30 seconds. Assist Sensitivity and Pressure Support will flash between OFF and three dashes. If the expected data does not appear, the Monitor Display will read "FAIL XXX". Every 32 milliseconds, the Monitor Display will indicate which data failures did not appear from 0 to 999. Remove fiber optic test cable (P/N 15205).

4.8.3.56 Turn ON/OFF circuit breaker to the OFF position.

4.8.3.57 Unplug the Exhalation Valve from power board at J202.

4.8.3.58 Plug current measuring test fixture (P/N 15137) into the power board at J202.

4.8.3.59 Plug Exhalation Valve into the current measuring test fixture. Connect DVM to current measuring test fixture. Set DVM to 200 mA D.C. reading.

4.8.3.60 Turn ON/OFF circuit breaker to the ON position and press the select button until Monitor Display will read "XVLVTST" (Exhalation Valve Test). Set low peak pressure alarm to 10 cmH_2O. Press manual breath button: Monitor display will read "XVLV CAL."

4.8.3.61 DVM must read 181 ± .25 mA. If necessary, adjust potentiometer located on the solder side of the power board for P/N 50070 or for P/N 50160 potentiometer will be located at R262 the component side of board.

4.8.3.62 Turn ON/OFF circuit breaker to the OFF position and disconnect the current measuring test fixture (P/N 15137) from J202 and disconnect Exhalation Valve plug from the current measuring test fixture (P/N 15137).

4.8.3.63 Connect Exhalation Valve plug into J202.

4.8.3.64 Turn ON/OFF circuit breaker to the ON position.

4.8.3.65 Press Select button until Monitor Display reads: "XVLV TST" (Exhalation Valve Test).

NOTE Unit must run for 30 minutes prior to this test.

4.8.3.66 Remove Exhalation Valve body (P/N 10188) and Diaphragm (P/N 20107).

4.8.3.67 Set Mode Selector to Time Cycled IMV/CPAP.

4.8.3.68 Set INSPIRATORY TIME to 3.0 seconds. Set Low Peak to **OFF**. This test will check the basic operation of the Exhalation Valve, from a full open position to a full closed position.

4.8.3.69 Press Manual Breath button: Time the intervals at the full closed position (Poppet out) to the next full closed position (Poppet out). The time should be 6.0 seconds ± 0.2.

4.8.3.70 Press Select button: Monitor display will read "FLOW TST" (Flow valve test).

4.8.3.71 Press Manual breath button: Set flow rate to 10. This will set the Flow valve to deliver 10 LPM through the Flow valve.

- Press Select button: Monitor Display will read FLOW POS.

4.8.3.72 Press Manual breath button twice: The Monitor display will read "FLOW CAL" (Flow Calibration). The flow control valve will lose power and the flow valve spring will close the valve.

4.8.3.73 Attach flow tube to patient outlet manifold (P/N 10089). Flow from the patient outlet should not exceed 0.04 LPM.

4.8.3.74 Attach negative lead of the DVM to analog ground located at TP101 under 10 pin molex connector at J3 on main P.C.B.A.

4.8.3.75 Using a DVM, measure the voltage at TP1003 (Test Point) and at TP1004 (Test Point). Both test points should show nearly the same voltages and should be near 2.5 V.D.C.

4.8.3.76 Compute the average of TP1003 (Test Point) and TP1004 (Test point).

4.8.3.77 Measure the voltage at TP1005 (Test Point) and adjust, if necessary, the potentiometer R1013 until the voltage at TP1005 (Test Point) is equal to the computed average of TP1003 (Test Point) and TP1004 (Test Point). Again, this voltage should be 2.5 V.D.C. $\pm$.2 V.D.C.

4.8.3.78 Press Select button: Monitor Display will read "QUAL CHK" (Flow Valve Quality Test).

4.8.3.79 Set Breath Rate to zero (0).

4.8.3.80 Press Manual Breath button: This test provides the user with an automated test of the flow valve's ability to move rapidly between extreme flow settings. The flow valve starts at the full closed position (0 lpm) and moves to the full open position (120 lpm) and back to the full closed position. This motion is repeated and then the upper target position is decremented to 119 lpm. The motion is repeated and the upper target is decremented following each pair of motions. When the upper target position reaches 0, the lower position is incremented and the upper limit is reset to 120 lpm. Once this occurs, the valve is moved from the 1 lpm flow position to the 120 lpm position. This sequence is repeated until the lower flow position reaches 40 lpm.

4.8.3.81 This test will run for approximately five and one half minutes (5.5 minutes). Once the lower position reaches 40 lpm, the Monitor Display will read "QUAL DUN" (Flow valve Quality Test is complete).

4.8.3.82 Press Select button: Monitor display will read "SOLENOID" (Solenoid Tests).

4.8.3.83 Attach a single piece of breathing circuit and a 50cc test syringe to the Patient Outlet Manifold (P/N 10089).

4.8.3.84 Depress syringe pulnger forcing air into the breathing circuit to verify the Safety Valve is closed and that the CIRCUIT FAULT ALARM is triggered. Press Reset button.

Table 4.8.3a

STANDARD TEST CONDITIONS

ID NO.	TC-1	TC-2	TC-3	TC-5	TC-7	TC-8	TC-9	TC-10	TC-11
INPUTS									
LINE VOLT	120	120	120	120	120	120	120	120	120
AUX DL INPUT	---	---	---	---	---	---	---	---	---
O_2 INLET P.	50	50	50	50	50	50	50	50	50
AIR INLET P.	50	50	50	50	50	50	50	50	50
CONTROLS									
MODE	ASSIS	ASSIS	ASSIS	ASSIS	ASSIS	SIMV	SIMV	SIMV	TCPL
TIDAL VOLUME	400	400	400	400	400	400	400	400	---
PEAK FLOW	20	30	60	60	40	40	40	40	20
BREATH RATE	5	5	5	5	10	0	0	10	5
ASSIST SENS.	OFF	OFF	OFF	OFF	OFF	-1	-1	OFF	---
INSPIR. TIME	---	---	---	---	---	---	---	---	2.0
PRES. SUPRT.	---	---	---	---	---	OFF	20	OFF	---
PEEP/CPAP	0	0	0	0	5	15	15	0	5
HIGH P LIMIT	120	120	120	120	120	120	120	120	15
02 CONCENT.	60	60	60	60	60	60	60	60	60
ALARMS									
OVER PRES. R	130	130	130	130	130	130	130	130	130
LOW PEAK	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LOW PEEP	-9	-9	-9	-9	-9	-9	-9	-9	-9

4.8.3.85 Press Manual Breath button: Monitor display will read "SAFETY" (Safety Solenoid).

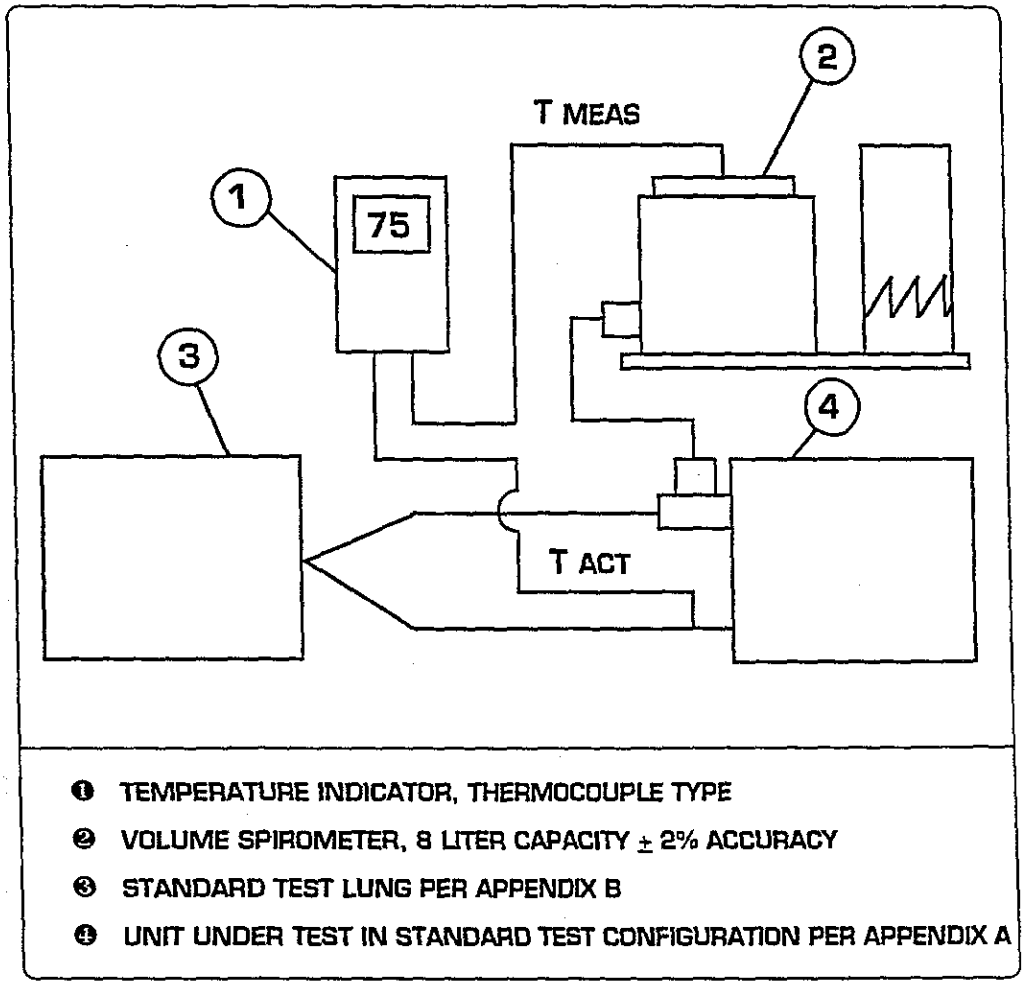
4.8.3.86 At this time, retracting and depressing the syringe plunger will be possible through the safety system and no alarm should be triggered. Remove breathing circuit and syringe from patient outlet.

4.8.3.87 Press Select button: Monitor display will read "JET PUMP" (Jet Pump Solenoid). Remove tube assembly #7 form Jet pump block. Connect flow tube or equivalent to the barb connector on the Jet pump block where tube assembly #7 was removed.

4.8.3.88 Flow should measure 5.5 lpm ± .5 lpm. Reconnect tube assembly #7 to the barb connector.

Figure 3.8.3d

TEST SETUP NO. 1



❶ TEMPERATURE INDICATOR, THERMOCOUPLE TYPE
❷ VOLUME SPIROMETER, 8 LITER CAPACITY ± 2% ACCURACY
❸ STANDARD TEST LUNG PER APPENDIX B
❹ UNIT UNDER TEST IN STANDARD TEST CONFIGURATION PER APPENDIX A

4.8.3.89 Press Select button: Monitor display will read "WDOG TST" (Watch Dog Timer Test).

4.8.3.90 Press Manual Breath button: the following will occur: Once activated, this function intentionally causes the watch dog timer to fail and determines the amount of time it takes for the ventilator to enter the VENT INOP state. The time is indicated to the user on the Monitor when the display changes to "WDOG xxx" where xxx is a one millisecond counter. The timer is considered within tolerance if the counter reads 100 ± 32 milliseconds.

NOTE

This routine cannot be halted and requires power to be removed and reapplied to the ventilator for the ventilator to become operational once this function is invoked.

4.8.3.91 Set ventilator ON/OFF (I/O) circuit breaker to **OFF** (0) position on rear panel.

4.8.3.92 Locate DIP switch on the main board at SW504. This is the eight (8) switch DIP switch.

4.8.3.93 Set switch #4 and #8 to the **OFF** position; switch #5 to the **ON** position. If the unit has Auto Zero, set switch #6 and #7 to the **ON** position.

4.8.3.94 Install exhalation valve diaphragm (P/N 20107) and exhalation valve housing (P/N 10087).

4.8.3.95 Assemble breathing circuit (P/N 10134) to ventilator as in Section 3.0 on page 3-22.

4.8.3.96 Set oxygen concentration selection knob of blender to 60%.

4.8.3.97 Set Pressure Relief valve (P/N 10092) to full clockwise position (CW).

4.8.3.98 While depressing Select button, set ventilator ON/OFF (I/O) circuit breaker to **ON** (I) position.

4.8.3.99 Keep Select button depressed until the number #226 is shown in the Monitor Display.

4.8.3.100 Approximately 10 seconds after the number #226 is shown in the Monitor Display, the message "CAUTION REMOVE PATIENT PRESS SELECT TO BEGIN U.V.T." will read in the Monitor Display.

NOTE

Before pressing Select button, be sure that the patient circuit is not connected to the test lung.

4.8.3.101 Press Select button until Monitor Display reads "O TST" (Transducer Zero (0) Test).

4.8.3.102 Press Select button: Monitor Display will read "O PASS" (Transducers Have Passed Zero (0) Test).

4.8.3.103 Press Select button: Monitor Display will flash message "PRSR TST BLOCK PATIENT WYE PRESS SELECT".

4.8.3.104 Block WYE using stopper (P/N 01230) or equivalent. Stopper must have dimensions as follows: 15mm I.D. or 22mm O.D. for proper seal.

4.8.3.105 Press Select button: Monitor display will read "TESTING".

4.8.3.106 Monitor Display will read "TESTING" for approximately ten (10) seconds then the Monitor Display will read "PRS PASS" (Pressure Test has Passed).

4.8.3.107 Press Select button: Monitor Display will read "LEAK PASS" (Leakage Test has Passed).

4.8.3.108 Remove stopper from Patient WYE. Press Select button: Unit will resume normal operation.

4.8.3.109 Set ventilator to test condition TC-8 as shown on page 4-101.

4.8.3.110 **PROXIMAL FLOW TEST:**

Using a flow tube or equivalent, measure flow out of the Proximal Port.

4.8.3.111 Flow from Proximal Port must be .03 - .08 lpm.

4.8.3.112 **EXHALATION FLOW TEST:**

Using a flow tube or equivalent, measure flow out of the Exhalation pressure transducer port.

4.8.3.113 Flow from Exhalation pressure transducer port must be .03 - .08 lpm.

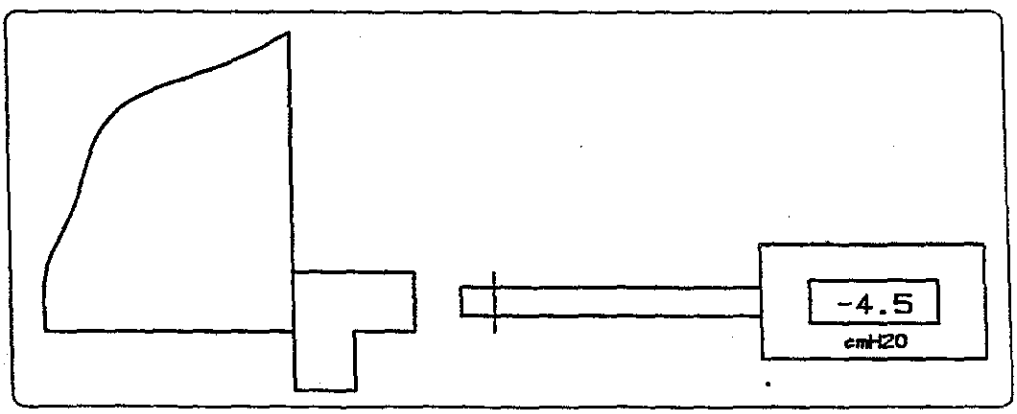
4.8.3.114 **JET PUMP TEST:**

Set ventilator to Test Condition TC-11 as shown on Page 4-101

4.8.3.115 Set Breath Rate and PEEP/CPAP to zero (0). Disconnect the exhalation leg of patient circuit from the exhalation valve body (P/N 10087). Remove exhalation valve diaphragm, and reinstall exhalation valve body (P/N 10087).

4.8.3.116 Attach validyne or equivalent to the inlet of the exhalation valve body as shown below.

Figure 4.8.3e



4.8.3.117 Validyne must be on the negative pressure setting. Pressure must read greater (>) than -3.0 cmH_2O and less (<) than -6.0 cmH_2O.

4.8.3.118 Reinstall Diaphragm and circuit.

4.8.3.119 TIDAL VOLUME:

Set ventilator to test condition TC-1 as shown on Page 4-101 of this manual.

4.8.3.120 Between the end of expiration and the beginning of the next inspiration, connect the hose from the outlet of the exhalation valve body (P/N 10087) to the inlet of the spirometer as shown in TEST SET UP #1 on page 4-101.

4.8.3.121 Deliver and collect five (5) breaths. Disconnect spirometer immediately after the fifth breath to avoid collecting additional proximal bleed flow.

4.8.3.122 The spirometer must indicate 2.0 liters ± 10%.

4.8.3.123 Repeat this using test conditions TC-2 and TC-3 on Page 4-101.

4.8.3.124 If 2.0 liters ± 10% is not met, refer to the following calculation formula:

$$Vcal = \frac{(Vmeas-.10)}{} * X1 * X2 \; Vcal$$

$$X1 = \frac{558}{Tmeas + 460}$$

$$X1 = \frac{Tvalv + 460}{Tmeas + 460} * 558$$

4.8.3.125 BREATH RATE:

Set ventilator to Test condition TC-3 as shown on Page 4-101.

4.8.3.126 Set breath rate to 10. Measure the time interval between breaths using a stop watch while observing the pressure excursions on the manometer, from the beginning of inspiration to the beginning of the next inspiration.

4.8.3.127 Verify that the breath interval is 6.0 seconds ± 0.2 seconds. If breath intervals are not within the tolerance of ± 0.2 seconds, refer to Section 3. 3.5 - Troubleshooting of this manual.

4.8.3.128 **PEEP/CPAP/SENSITIVITY**

Set ventilator to Test condition TC-8. On page 4-101.

4.8.3.129 Verify that no auto cycling occurs and that PEEP/CPAP reading on the manometer is 15 $cmH_2O \pm 2$.

4.8.3.130 Set PEEP/CPAP to 24 cmH_2O. Verify reading on manometer is 24 $cmH_2O \pm 2$.

4.8.3.131 If PEEP/CPAP/SENSITIVITY is not met, refer to Section 3, 3.5 - Troubleshooting of this manual.

4.8.3.132 **MANUAL OVER-PRESSURE RELIEF VALVE (P/N 10092):**

Set ventilator to Test condition TC-1. On page 3-101.

4.8.3.133 Set breath rate to ten (10), and flow to ten (10)block patient wye.

4.8.3.134 This is a mechanical test, only to verify that the over-pressure relief is functional.

4.8.3.135 While observing the excursion of the manometer, adjust the over-pressure relief valve counterclockwise (CCW) UNTIL 80 $cmH_2O + 10$ is reached. Then, adjust the over-pressure relief valve counterclockwise (CCW) until 50 cmH_2O is reached.

NOTE

Readjust the over-pressure relief valve full clockwise (CW) at the end of this test.

4.8.3.136 **MONITOR DISPLAY:**

Set ventilator to Test condition TC-7 for the next five (5) test conditions.

4.8.3.137 Breath rate as indicated on the Monitor display must read 10 after four (4) mechanical breaths.

4.8.3.138 Inspiratory time as indicated on the Monitor Display must read 0.60 ± 0.10 seconds.

4.8.3.139 I:E Ratio as indicated on the Monitor Display must read 1:9.0.

4.8.3.140 Peak Inspiratory Pressure (PIP) as indicated on the Monitor Display must read 50 cmH_2O ± 10.

4.8.3.141 Mean Airway Pressure (MAP) as indicated on the Monitor Display must read 9 cmH_2O ± 2.

NOTE ✍

If any of these Monitor displays do not meet the tolerance ranges, refer to Section 3.5: Troubleshooting Guide on page 3-40.

4.8.3.142 ALARMS: Apnea/Silence/Reset

a) Set ventilator to Test conditions TC-8.

b) Activate Manual Breath and using a stopwatch, time the interval from beginning of the manual breath until the activation of the audible and visual apnea. Time must be 20 seconds ± 2.

c) Press silence and time the interval from beginning of silence activation until audible alarm reoccurs. Time must be 60 seconds ± .5 seconds.

d) Press manual breath button audible alarm must silence.

e) Press reset button visual indicator must go out (OFF).

4.8.3.143 HIGH PRESSURE LIMIT

a) Set ventilator to Test condition TC-7. Set high pressure limit to 60 cmH_2O.

b) Between breaths, block the exhalation valve outlet.

c) Using a stopwatch, verify that within one (1) second ± .2 after the end of the first breath that the high pressure L.E.D. illuminates.

d) Using a stopwatch, measure the time from visual high pressure limit violation "flashing" until the safety system activates and begins to dump. Time must be three (3) seconds ± .5 seconds. Also, verify that at the time the safety system activates the circuit fault L.E.D. illuminates.

e) Observe manometer pressure must drop below 12 cmH_2O before the next breath delivery is activated.

f) Remove blockage from exhalation valve outlet. Press reset button: verify that high pressure L.E.D. and the circuit fault L.E.D. cancel.

4.8.3.144 LOW PEAK PRESSURE ALARM

a) Set ventilator to Test condition TC-7.

b) Set Low Peak Pressure alarm to 60 cmH_2O.

c) Verify that audible and visual alarms are activated.

d) Set Low Peak Pressure to **OFF**, verify after next breath delivery audible alarm cancels and the **OFF** flashes.

4.8.3.145 LOW PEEP/CPAP PRESSURE ALARM

a) Set ventilator to Test condition TC-7.

b) Set Low PEEP/CPAP Pressure alarm to 10 cmH_2O.

c) Verify audible and visual alarm is activated.

d) Set Low PEEP/CPAP Pressure alarm to -9 cmH_2O. Verify that the audible alarm cancels.

e) Press reset, verify visual flashing cancels.

4.8.3.146 VENT INOP ALARM

a) Set ventilator to Test condition TC-7.

b) Remove electrical power to ventilator.

c) Verify audible and visual vent inop alarm activates.

d) Reapply electrical power to ventilator. Verify return to normal operation and that the audible and visual alarm is cancelled.

e) Remove gas supply to ventilator. Verify audible and visual Low Inlet Gas Alarm is activated followed by audible and visual vent inop alarm.

f) Restore gas supply, verify Low inlet gas LED cancels as well as vent inop LED, and unit resumes normal operation.

4.8.3.147 CIRCUIT FAULT ALARM

a) Set ventilator to Test condition TC-7.

b) Remove Proximal Pressure line: Verify audible and visual Circuit fault alarm activated.

c) Reconnect Proximal Pressure line: Verify audible alarm cancels.

d) Press Reset button: Verify visual circuit fault LED cancels.

4.8.3.148 ELECTRICAL POWER TOLERANCE

a) Set ventilator to Test condition TC-7.

b) Connect variable power source (uncalibrated variac) to ground wall outlet.

c) Connect ventilator power cord to variable power source (variac).

d) Switch variac ON and set to local power voltage.

e) Position ventilator ON/OFF (I/O) circuit breaker to ON (I).

f) Set variac output power to low end of specified voltage range, as follows:

For 100 volt units:	85 volts
" 120 volt units:	102 volts
" 220 volt units:	187 volts
" 240 volt units:	204 volts

g) Verify ventilator operates normally for five (5) machine breaths.

h) Set variac output voltage to high end of specific voltage range, as follows:

For 100 volt units:	110 volts
" 120 volt units:	132 volts
" 220 volt units:	242 volts
" 240 volt units:	264 volts

i) Verify ventilator operates normally for five (5) machine breaths.

j) Set variac output voltage to "brown out" voltage, as follows:

For 100 volt units:	70 volts
" 120 volt units:	85 volts
" 220 volt units:	154 volts
" 240 volt units:	168 volts

k) Verify that the ventilator at least briefly shows vent inop alarm (audible and visual) activation followed by power up and restart.

4.8.3.149 GROUND CONTINUITY

a) Measure ground continuity between power cord ground plug and socket head cap screws on the bottom sealing plate of the ventilator.

b) Verify ground resistance is less (<) than 0.1 ohms (Ω).

4.8.3.150 LEAKAGE CURRENT

a) Check for maximum leakage current by comparing normal and reversed connections in both open/closed ground conditions.

b) Verify leakage current under all conditions is less (<) that 100 micro amps (MA).

4.8.4 Post Operational Verification

4.8.4.1 Remove power cord from electrical source.

4.8.4.2 Remove gas supply hoses.

4.8.4.3 Slide top cover (P/N 20122) into place and secure using the four (4) cap head screws.

4.8.4.4 Clean external surfaces of the ventilator per Section 3.0, 3.4 of this manual.

WARNINGS !

Before putting ventilator into service, be sure a performance test is done as described in Section 4.2 on page 4-2.

4.8.5 V.I.P. BIRD Vent Inop Codes

```
00   ; Should never occur
01   ; CPU A executed unused memory space
02   ; CPU B executed unused memory space
03   ; CPU C executed unused memory space

04   ; CPU B sent CPU A VENT INOP data
05   ; CPU B did not interrupt CPU C
06   ; CPU A did not interrupt CPU B
07   ; CPU A did not complete 32 mSec in time
08   ; Dual-Port watchdog timed out
09   ; CPU B or CPU C failed watchdog check byte

10   ; CPU A could not determine breath type
11   ; Safety bytes received by CPU A did not match
12   ; Safety bytes received by CPU B did not match
13   ; Timeslot bytes received by CPU B did not match
14   ; Timeslot bytes received by CPU C did not match

15   ; Watchdog PAL has failed
16   ; PROM configuration bytes do not match
17   ; Ventilator mode switch failed
18   ; Waveform switch failed
19   ; unused
20   ; Pot 00 reading was over range (FFH)
21   ; Pot 01 reading was over range (FFH)
22   ; Pot 02 reading was over range (FFH)
```

4.8.5 Vent Inop Codes Continued

```
23  ; Pot 03 reading was over range (FFH)
24  ; Pot 04 reading was over range (FFH)
25  ; Pot 05 reading was over range (FFH)
26  ; Pot 06 reading was over range (FFH)
27  ; Pot 07 reading was over range (FFH)
28  ; Pot 08 reading was over range (FFH)
29  ; Pot 09 reading was over range (FFH)
30  ; Pot 10 reading was over range (FFH)
31  ; Pot 11 reading was over range (FFH)
32  ; Pot 12 reading was over range (FFH)
33  ; Pot 13 reading was over range (FFH)
34  ; Pot 14 reading was over range (FFH)
35  ; Pot 15 reading was over range (FFH)
36  ; unused
37  ; unused
38  ; unused
39  ; unused
40  ; Pot 00 readings did not match
41  ; Pot 01 readings did not match
42  ; Pot 02 readings did not match
43  ; Pot 03 readings did not match
44  ; Pot 04 readings did not match
45  ; Pot 05 readings did not match
46  ; Pot 06 readings did not match
47  ; Pot 07 readings did not match
48  ; Pot 08 readings did not match
49  ; Pot 09 readings did not match
50  ; Pot 10 readings did not match
51  ; Pot 11 readings did not match
52  ; Pot 12 readings did not match
53  ; Pot 13 readings did not match
54  ; Pot 14 readings did not match
55  ; Pot 15 readings did not match
56  ; A/D #3 and #4 flow data readings do not match
57  ; A/D #3 and #4 exhalation data readings do not match
58  ; A/D #3 and #4 machine data readings do not match
59  ; A/D #3 and #4 prox data readings do not match
60  ; A/D #1 internal reference above tolerance
61  ; A/D #1 internal reference below tolerance
62  ; A/D #2 internal reference above tolerance
63  ; A/D #2 internal reference below tolerance
64  ; A/D #3 internal reference above tolerance
65  ; A/D #3 internal reference below tolerance
66  ; A/D #4 internal reference above tolerance
67  ; A/D #4 internal reference below tolerance
68  ; unused
```

```
69   ; unused
70   ; A/D #3 pot supply voltage above tolerance
71   ; A/D #3 pot supply voltage below tolerance
72   ; A/D #4 pot supply voltage above tolerance
73   ; A/D #4 pot supply voltage below tolerance
74   ; A/D #3 reference voltage above tolerance
75   ; A/D #3 reference voltage above tolerance
76   ; A/D #4 reference voltage above tolerance
77   ; A/D #4 reference voltage above tolerance
78   ; unused
79   ; unused
80   ; Flow valve did not home, volume breath, square wave
81   ; Flow valve did not home, volume breath, sine wave
82   ; Flow valve did not home, volume breath, acc taper wave
83   ; Flow valve did not home, volume breath, dec taper wave
84   ; Flow valve did not home, pressure supported breath
85   ; Flow valve did not home, spontaneous breath
86   ; Flow valve did not home, TCPL breath
87   ; Flow valve did not home, High frequency breath
88   ; unused
89   Flow valve illegal motion control code 00
90   ; Branch through mode switch indicated illegal setting
91   ; Branch through wave switch indicated illegal setting
92   ; unused
93   ; CPU B executed illegal jump in a branch table
94   ; CPU C executed illegal jump in a branch table
95   ; CPU A executed illegal jump in a branch table
96   ; Illegal self test access in CPU C
97   ; Illegal self test access in CPU A
98   ; Illegal self test number sent to CPU A

99   ; Watchdog timer failed to time-out
```

This section contains the numerical values written to the monitor display during the Power On Self Test. The writing of these numbers is embedded in the POST software of CPU C.

```
200  ; CPU C began execution of Interrupt Test
201  ; CPU C began execution of 8031 Timer Test
210  ; Invalid (corresponds to DPCB interrupt failure)
211  ; CPU A interrupt failure in DPAB
212  ; CPU A 8031 Internal Timer failure
213  ; CPU A 8031 Internal RAM failure
```

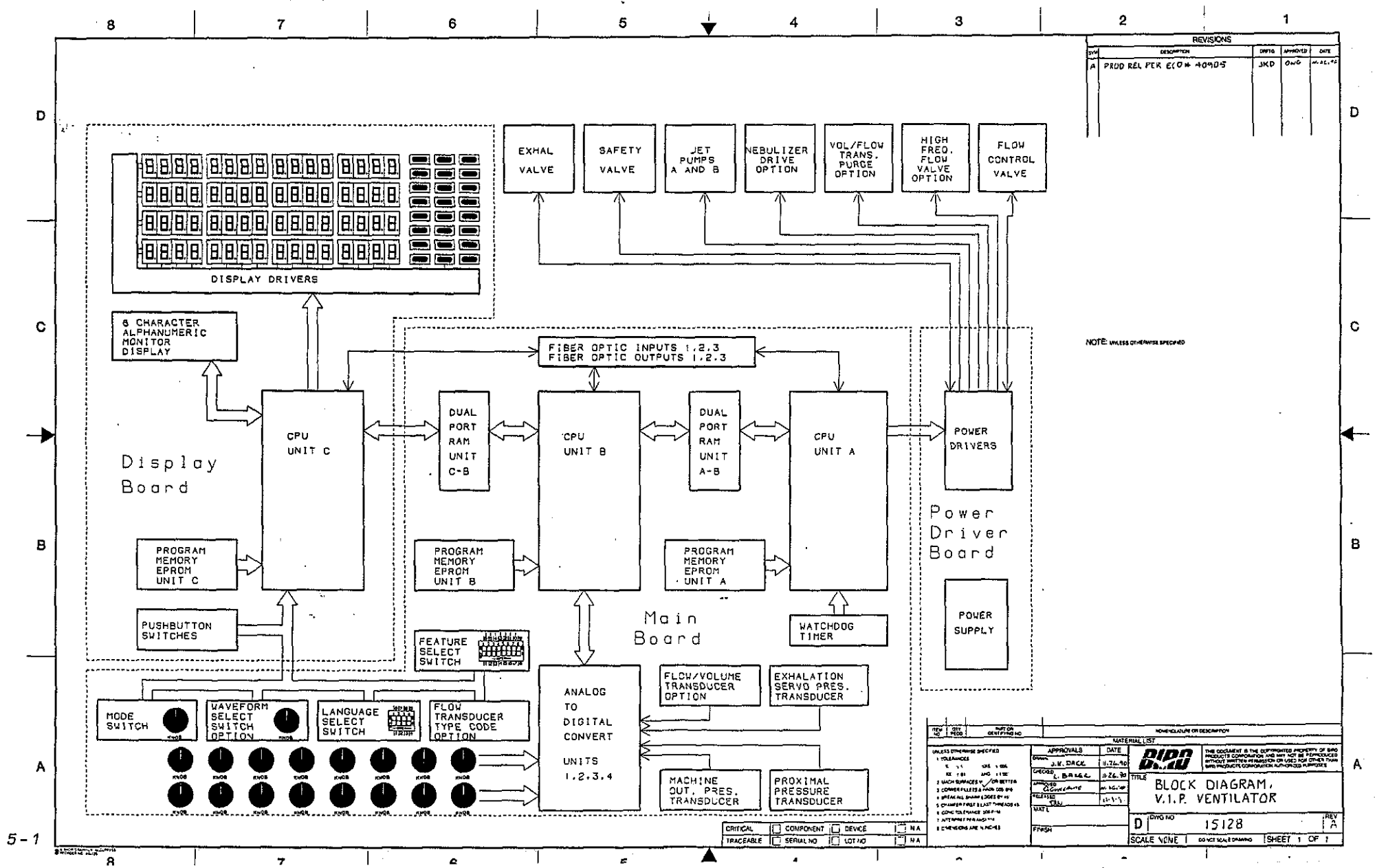
4.8.5 Vent Inop Codes Continued

```
214  ; CPU A Checksum failure
215  ; CPU A Stepper Motor failure
216  ; Invalid (corresponds to cell integrity test)
217  ; CPU A address test of DPAB
218  ; Invalid (corresponds to inverse address test)
219  ; Invalid (corresponds to monitor display failure)
220  ; CPU B Interrupt failure in DPCB
221  ; CPU B Interrupt failure in DPAB
222  ; CPU B 8031 Internal Timer failure
223  ; CPU B 8031 Internal RAM failure
224  ; CPU B Checksum failure
225  ; Invalid (corresponds to stepper motor failure)
226  ; CPU B cell integrity test of DPAB
227  ; CPU B address test of DPCB
228  ; CPU B inverse address test of DPAB
229  ; Invalid (corresponds to monitor display failure)
230  ; CPU C Interrupt failure in DPCB
231  ; Invalid (corresponds to DPAB interrupt failure)
232  ; CPU C 8031 Internal Timer failure
233  ; CPU C 8031 Internal RAM failure
234  ; CPU C Checksum failure
235  ; Invalid (corresponds to stepper motor failure)
236  ; CPU C cell integrity test of DPCB
237  ; Invalid (corresponds to address test)
238  ; CPU C inverse address test of DPCB
239  ; CPU C monitor display failure
```

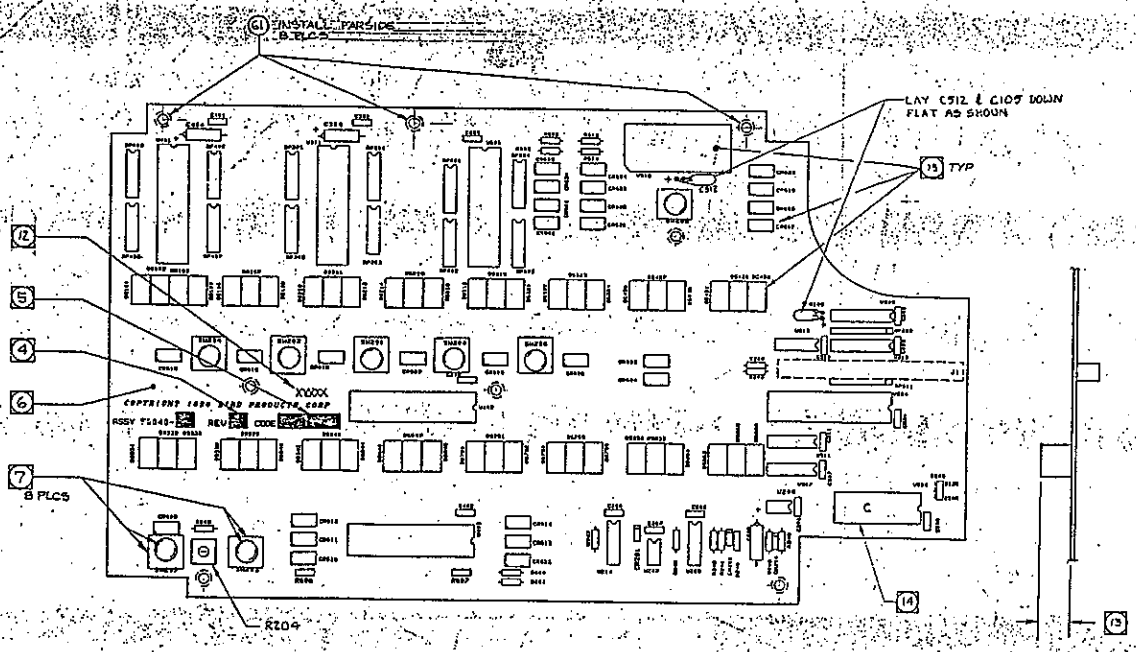
Section 5.0

Schematics - Drawings

5.1 Block Diagram, P/N 15128 5-1
5.2 PCBA, Display, P/N 50040 5-2
5.3 Schematic, PCBA, Display, P/N 50042 5-3
5.4 PCBA, Main, P/N 50050 5-9
5.5 Schematic, PCBA, Main, P/N 50052 5-10
5.6 PCBA, Power Driver, P/N 50070 5-20
5.7 Schematic, Power Driver, P/N 50072 5-21
5.8 PCBA, Power Driver, P/N 50[illegible] 5-25
5.9 Schematic, Power Driver, P/N 50[illegible] 5-27
5.10 PCBA, Display, Flow Synch., P/N 50250 5-31
5.11 PCBA, Main CPU, Flow Synch., P/N 50260 5-33


REVISIONS
A PROD REL PER ECO# 40905 JKD
EXHAL VALVE
SAFETY VALVE
JET PUMPS A AND B
NEBULIZER DRIVE OPTION
VOL/FLOW TRANS. PURGE OPTION
HIGH FREQ. FLOW VALVE OPTION
FLOW CONTROL VALVE
DISPLAY DRIVERS
6 CHARACTER ALPHANUMERIC MONITOR DISPLAY
FIBER OPTIC INPUTS 1,2,3
FIBER OPTIC OUTPUTS 1,2,3
CPU UNIT C
DUAL PORT RAM UNIT C-B
CPU UNIT B
DUAL PORT RAM UNIT A-B
CPU UNIT A
POWER DRIVERS
Display Board
PROGRAM MEMORY EPROM UNIT C
PROGRAM MEMORY EPROM UNIT B
PROGRAM MEMORY EPROM UNIT A
Power Driver Board
PUSHBUTTON SWITCHES
FEATURE SELECT SWITCH
Main Board
WATCHDOG TIMER
POWER SUPPLY
MODE SWITCH
WAVEFORM SELECT SWITCH OPTION
LANGUAGE SELECT SWITCH
FLOW TRANSDUCER TYPE CODE OPTION
ANALOG TO DIGITAL CONVERT
UNITS 1,2,3,4
FLOW/VOLUME TRANSDUCER OPTION
EXHALATION SERVO PRES. TRANSDUCER
MACHINE OUT. PRES. TRANSDUCER
PROXIMAL PRESSURE TRANSDUCER
CRITICAL COMPONENT DEVICE N/A
TRACEABLE SERIAL NO LOT NO N/A
NOTE: UNLESS OTHERWISE SPECIFIED
APPROVALS DATE
DRAWN J.K. DACK 11-26-90
CHECKED L. BRAGG 11-26-90
APPROVED
RELEASED
MAT'L
FINISH
BIRD
TITLE BLOCK DIAGRAM, V.I.P. VENTILATOR
D DWG NO 15128 REV A
SCALE NONE DO NOT SCALE DRAWING SHEET 1 OF 1

REVISIONS				
LTR	DESCRIPTION	DWN'D	APPROVED	DATE
A	PROD REL PER ECO 40709			
B	REVISE NOTE 7; ADD NOTE 12, PER ECO 36465			
C	REVISED PER ECO 41027	JKD	DWG	
D	INCORP ECO 33619	JED	CAH	
E	INCORP ECO 36705	EHL	CAH	
F	INCORP ECO 50069	EHL	APH	1-3-92
G	INCORP ECO 50396	JLM	APH	5-22-92
H	INCORP ECO 51633	EHL	APH	11-24-93



NOTE: UNLESS OTHERWISE SPECIFIED

1. REF. SCHEMATIC No 50042.
2. SEE BILL OF MATERIALS No 50040.
3. MATERIAL CERTIFICATION REQUIRED.
4. MARK ASSY REVISION LEVEL WITH INDELIBLE INK.
5. MARK LOT CODE ON COMPONENT SIDE OF PCB WITH INDELIBLE INK PER BIRD ENG. SPEC. SP102.
6. BOARD FABRICATORS UL RECOGNITION CODE APPROX. THIS AREA, SOLDER SIDE.
7. DOME SWITCHES, SW200-SW207 TO BE MOUNTED CONCENTRIC ON CONTACT PADS WITHIN .010 RADIAL SIZES USING .094 DIA. X .018 THICK.
8. MUST BE TRANSPORTED IN A CONDUCTIVE AND SHIELDED CONTAINER AND HANDLED AT A STATIC SAFE WORK AREA.
9. LUMINOUS INTENSITY CODE CATEGORY MUST BE THE SAME THROUGHOUT EACH PCB ASSY.
10. TRIM ALL LEADS TO .06 MAX.
11. SOLDER PER IPC-S-815B.
12. MARK SERIAL NO. ON COMPONENT SIDE OF PCB WITH INDELIBLE INK APPROX. WHERE SHOWN.
13. LCD & LED HEIGHT .496-.570"
14. PROGRAM EPROM IS INSTALLED ON FINAL ASSEMBLY.

ITEM NO	QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION

MATERIAL LIST

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES
X ± .1 .XXX ± .005
XX ± .01 ANG ± 1°00'
2. MACH SURFACES 125 OR BETTER
3. CORNER FILLETS R.005-.010
4. BREAK ALL SHARP EDGES .01 x 45°
5. CHAMFER 1 PLC 2 LAST THREADS 45°
6. GEOM TOLERANCE 305 Y14.5
7. INTERPRET PER ANSI Y14
8. DIMENSIONS ARE IN INCHES

APPROVALS	DATE
DRAWN	11/26/91
CHECKED L. BAILEY	12-11-91
APPROVED D. DAVIDSON	12-11-91
RELEASED	3-19-91
MAT'L	
FINISH	

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TITLE: PCBA, DISPLAY, VIP

D | DWG NO. 50040 E | REV. P

CRITICAL	☒ COMPONENT	☐ DEVICE	☐ N/A

REVISIONS				
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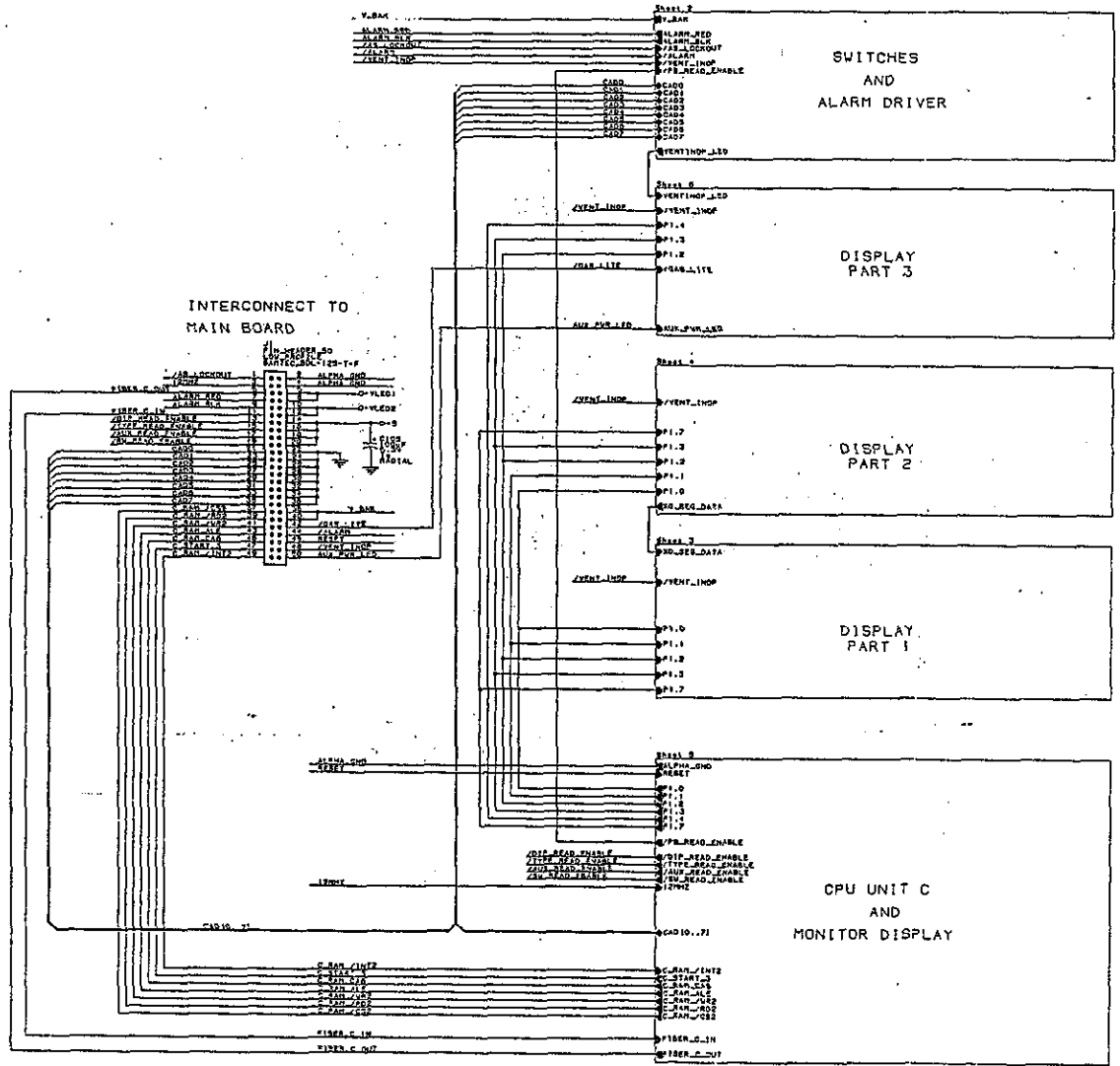
B	REVISED PER ECO# 41024	JKD		



NOTE: UNLESS OTHERWISE SPECIFIED.

CRITICAL	COMPONENT	DEVICE	N/A
TRACEABLE	SERIAL NO.	LOT NO	N/A

REV NO	QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION

MATERIAL LIST

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES
2. MACH SURFACES
3. CORNER FILLETS
4. BREAK ALL SHARP EDGES
5. CHAMFER FIRST
6. ODE TOLERANCE
7. FINISH PER
8. DIMENSIONS ARE

APPROVALS	DATE
DRAWN J.K. DAGG	7.31.90
CHECKED L. BAKER	7.31.90
APPROVED D. GUILLAUME	7.31.90
RELEASED	8-1-90
MAT'L	
FINISH	

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TITLE: SCHEMATIC, DISPLAY PCBA

D | DWG NO. 50042 | REV B

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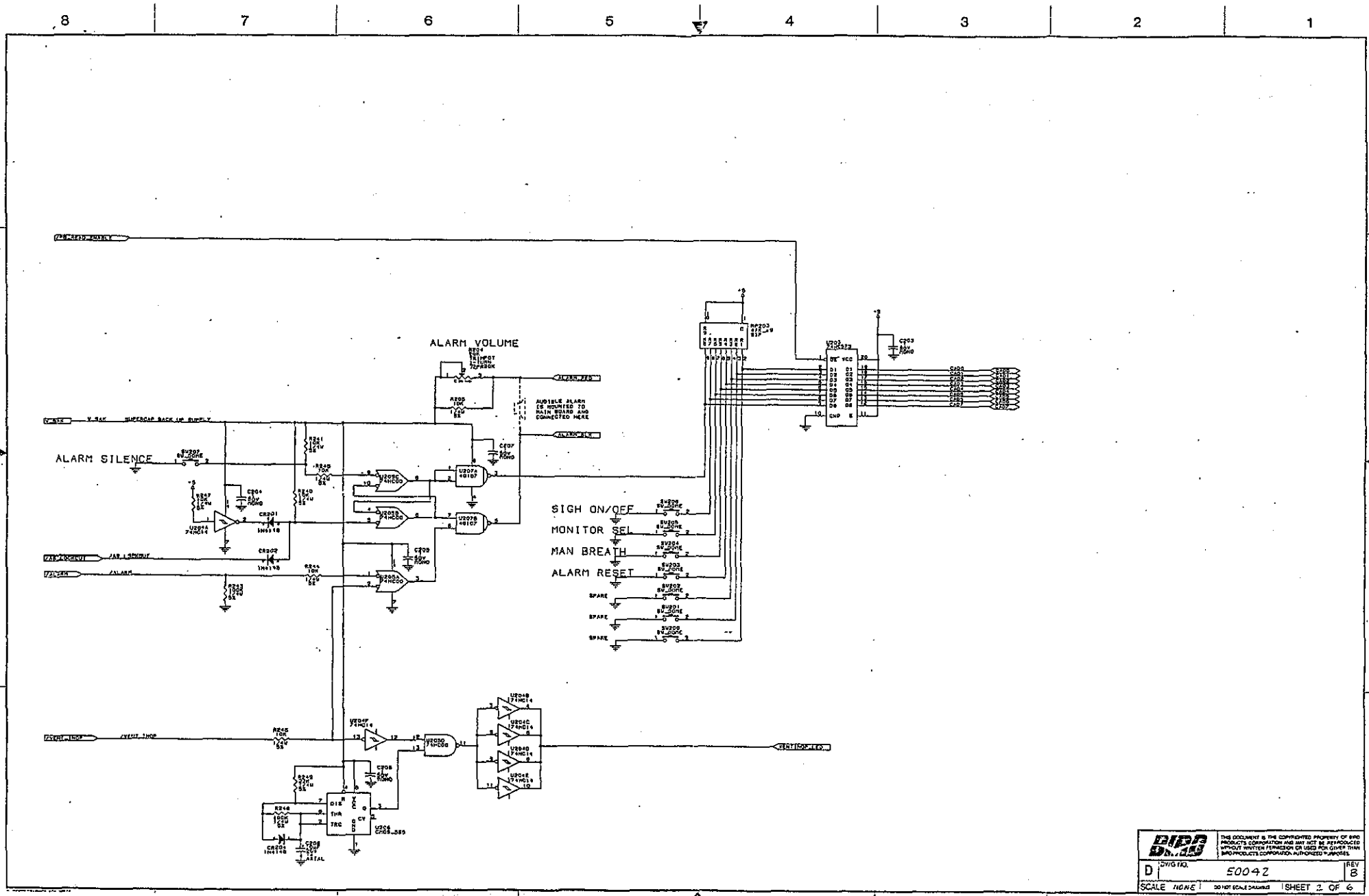

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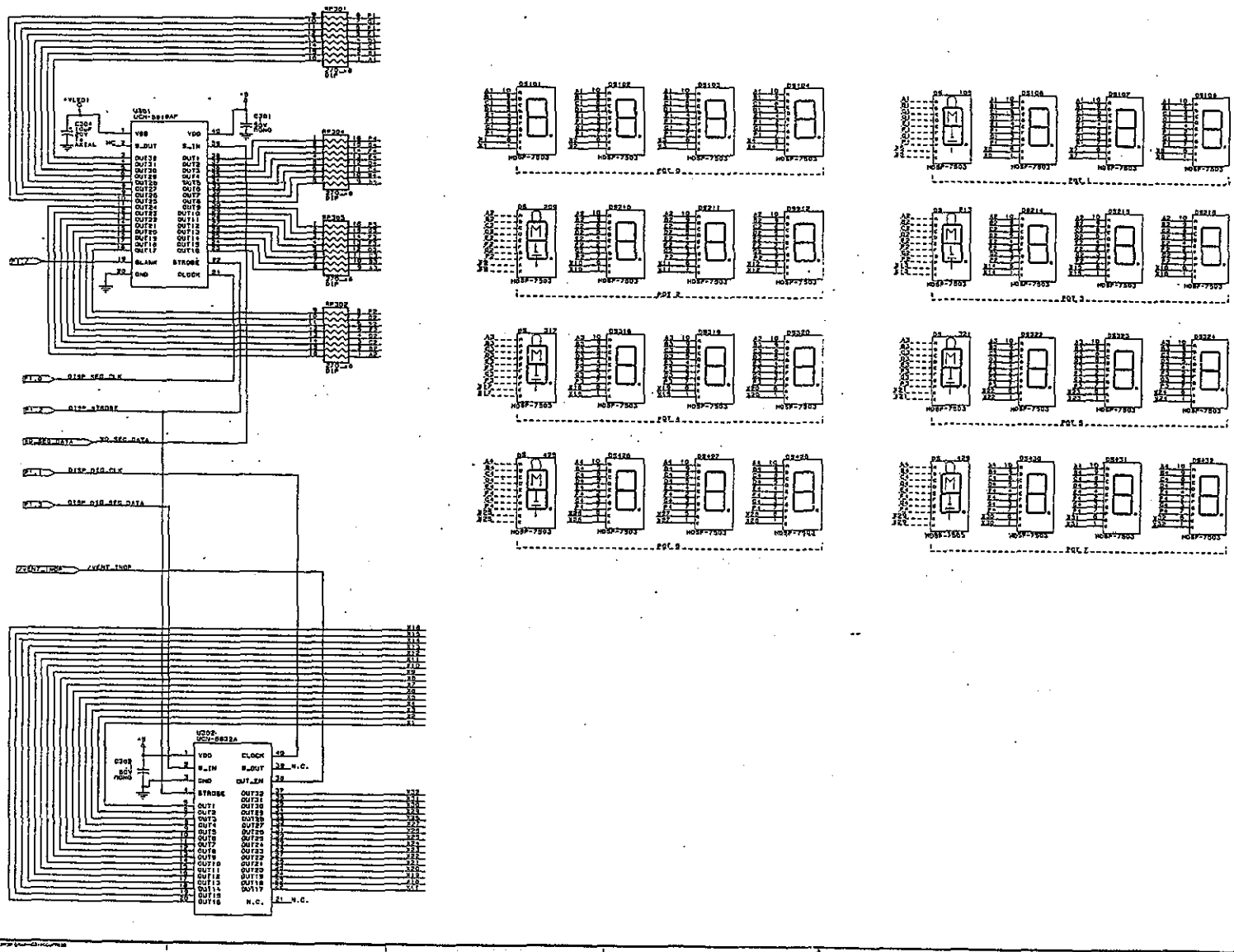

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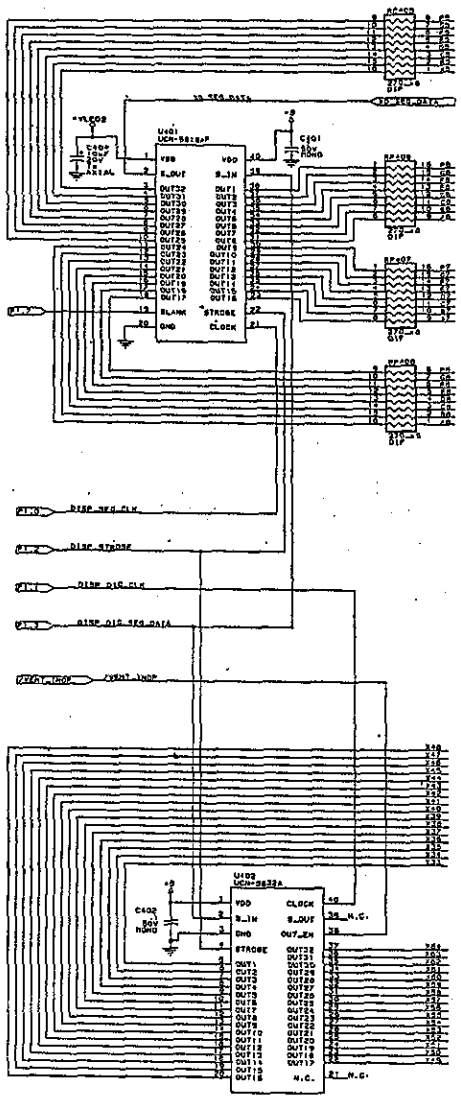

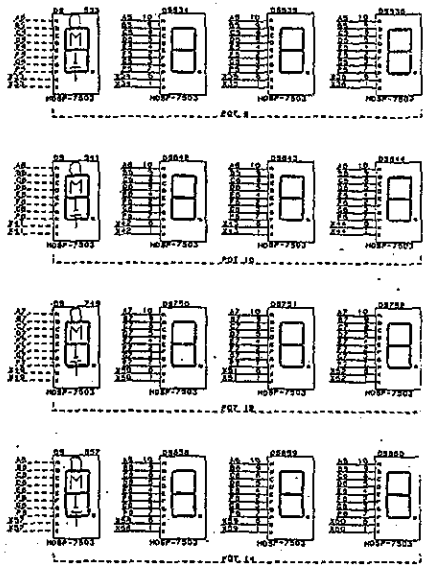

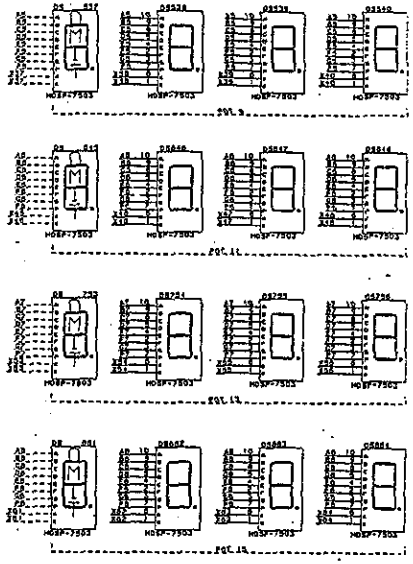

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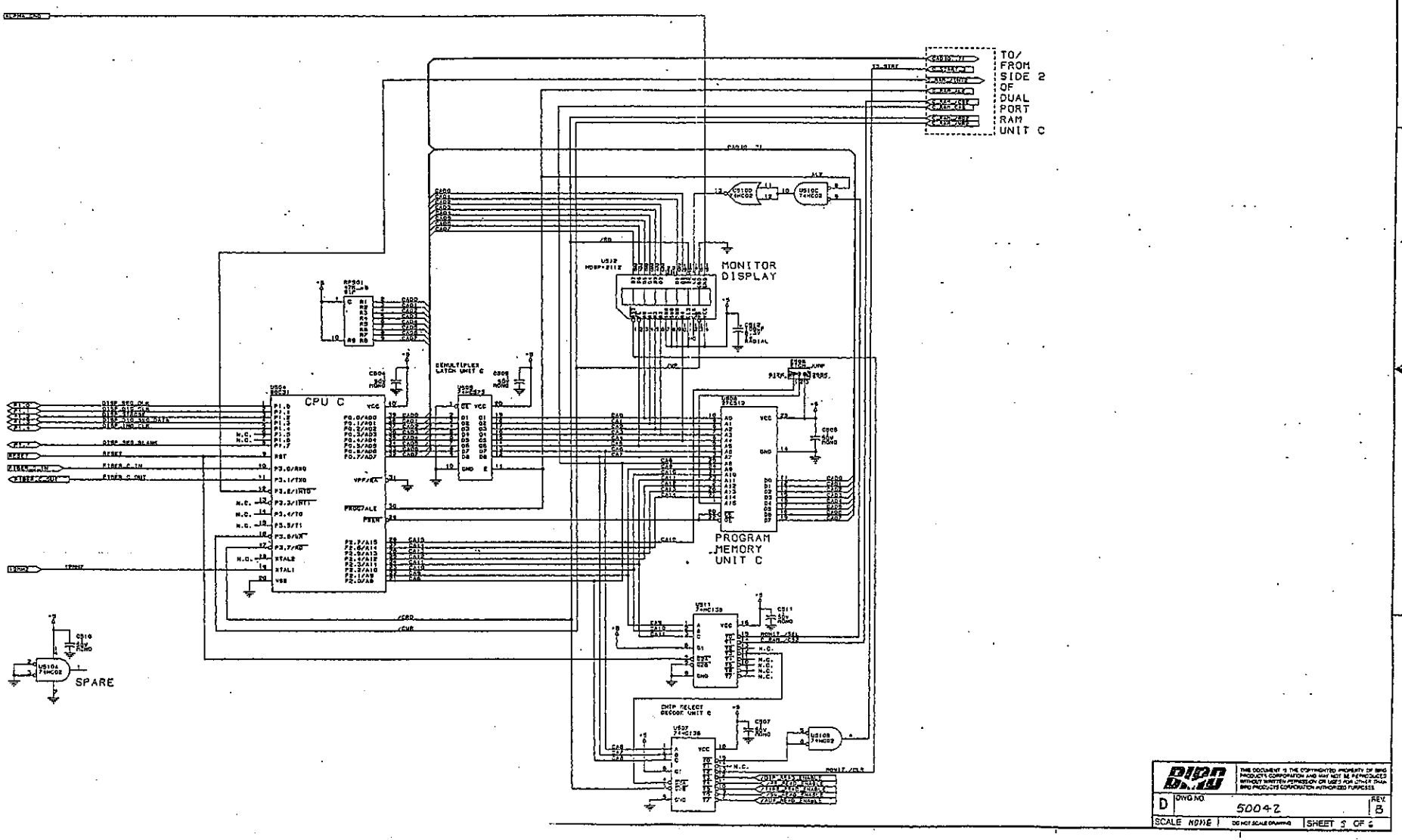

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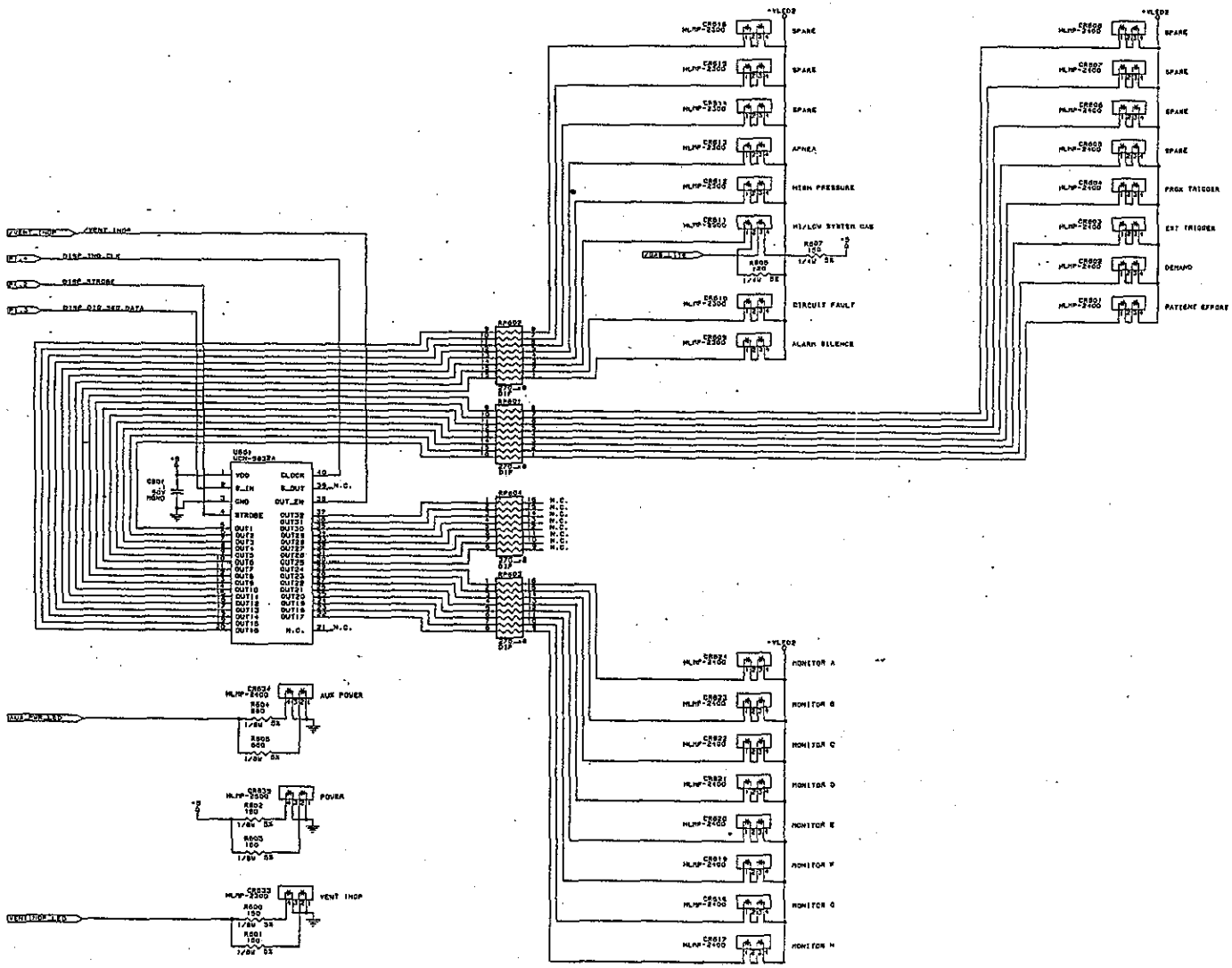

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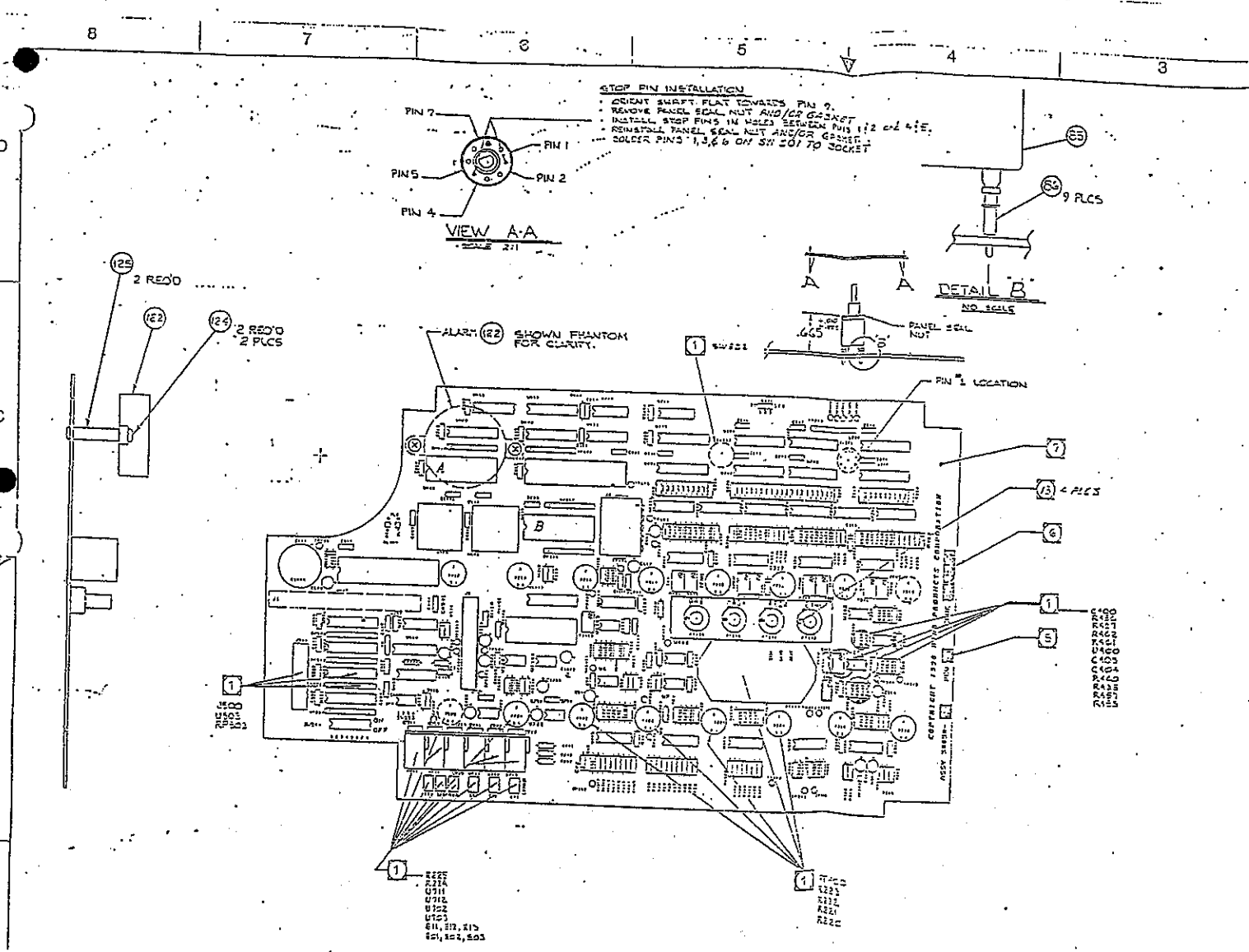
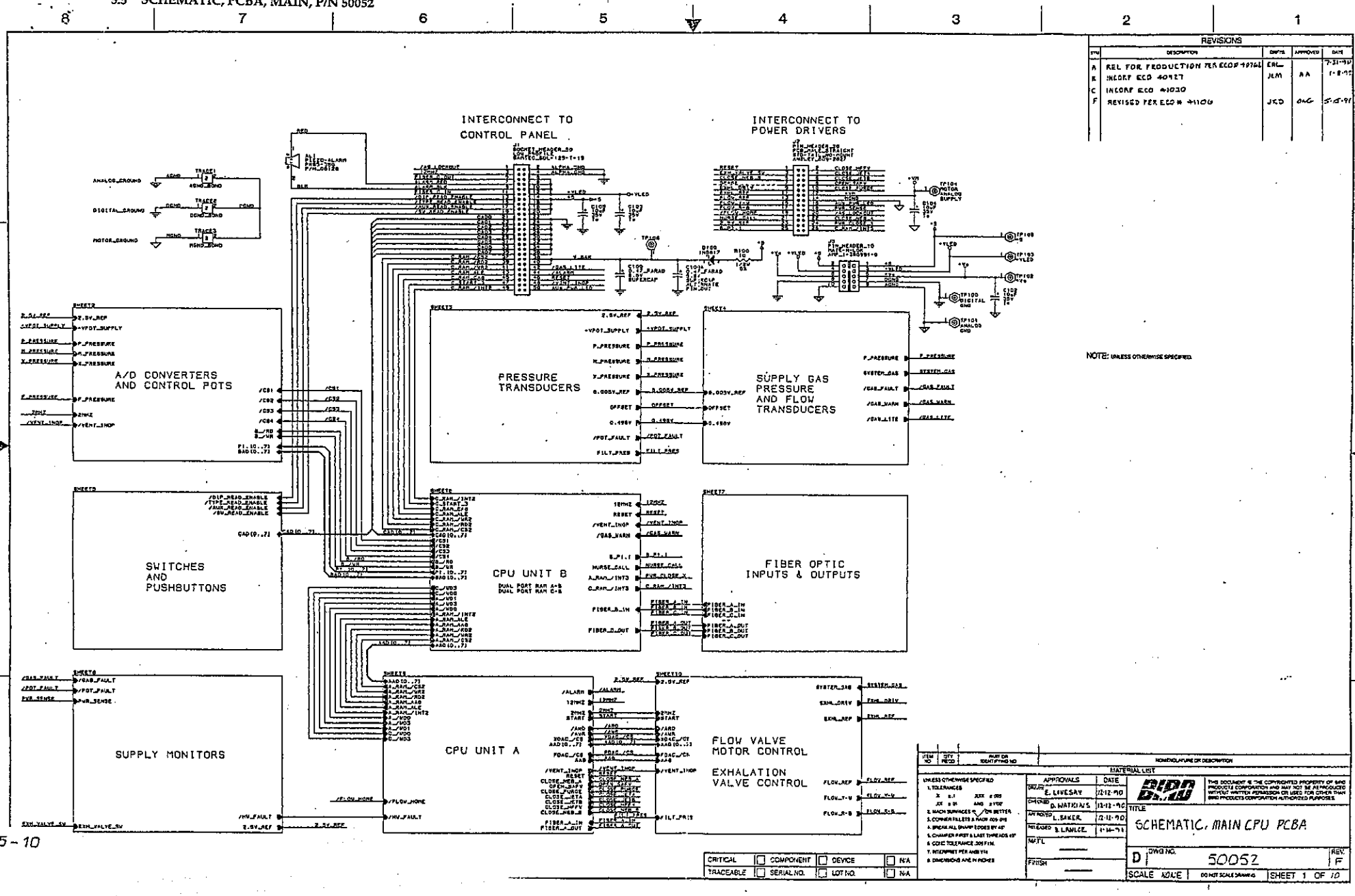
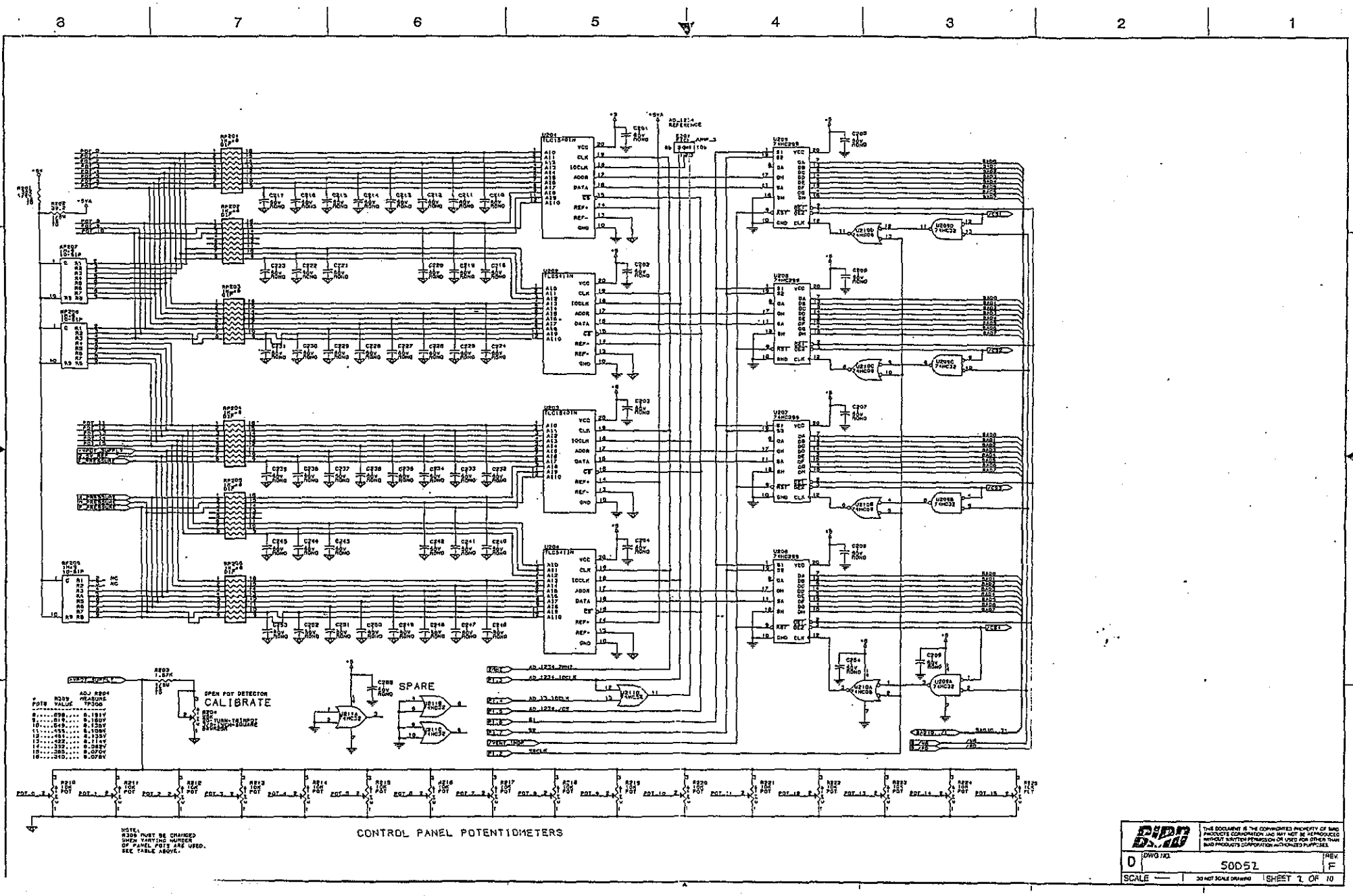


PCBA, MAIN

50050E


INTERCONNECT TO CONTROL PANEL
INTERCONNECT TO POWER DRIVERS
A/D CONVERTERS AND CONTROL POTS
PRESSURE TRANSDUCERS
SUPPLY GAS PRESSURE AND FLOW TRANSDUCERS
SWITCHES AND PUSHBUTTONS
CPU UNIT B
DUAL PORT RAM A<>B
DUAL PORT RAM C<>B
FIBER OPTIC INPUTS & OUTPUTS
SUPPLY MONITORS
CPU UNIT A
FLOW VALVE MOTOR CONTROL
EXHALATION VALVE CONTROL
REVISIONS
NOTE: UNLESS OTHERWISE SPECIFIED
MATERIAL LIST
TITLE
SCHEMATIC, MAIN CPU PCBA
DWG NO. 50052
REV. F
SHEET 1 OF 10



D	DWG NO. 50052		REV. F
SCALE —	DO NOT SCALE DRAWING	SHEET 1 OF 10	

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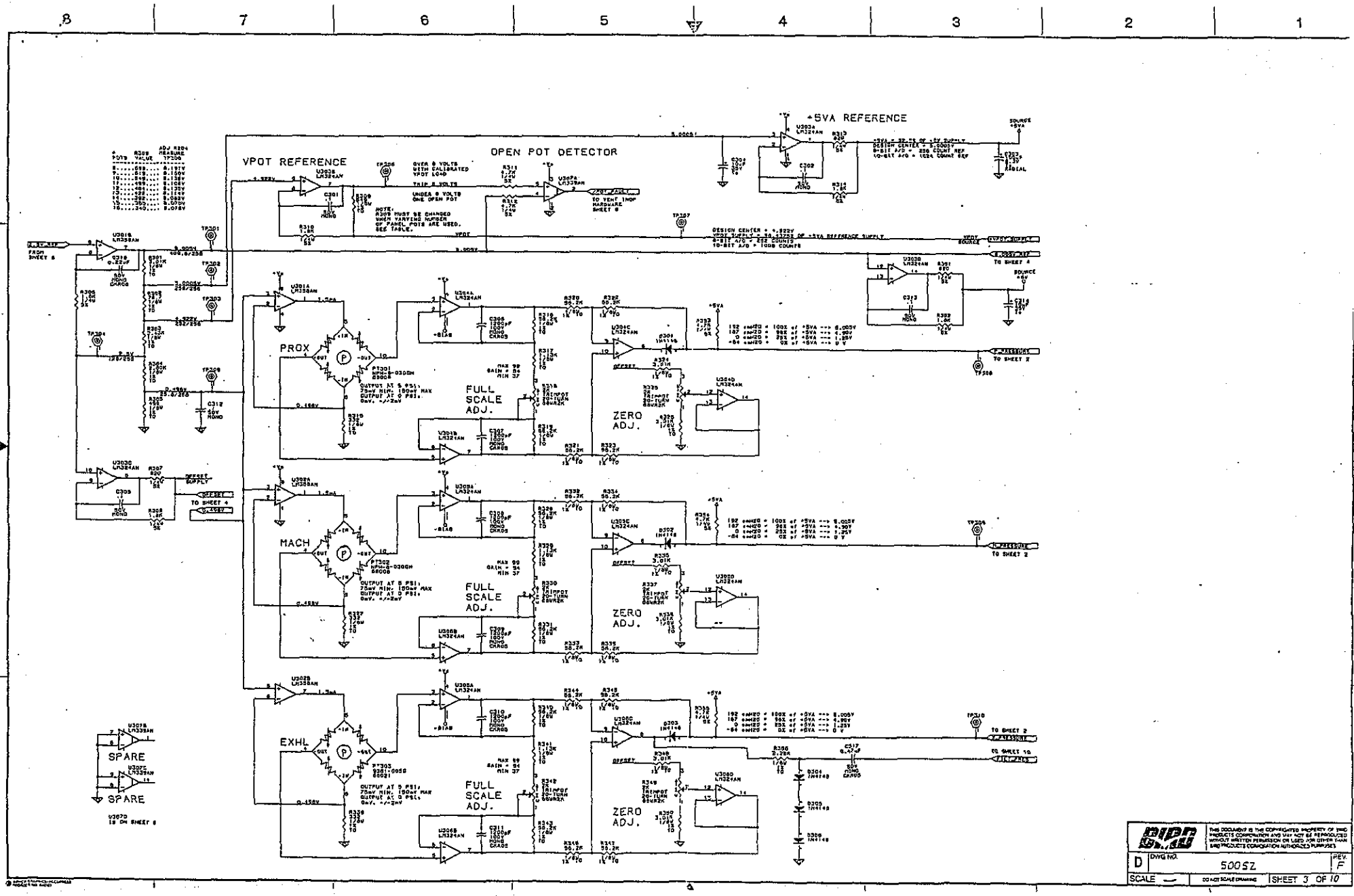

D	DWG NO. 50052		REV. F
SCALE —	DO NOT SCALE DRAWING	SHEET 3 OF 10	

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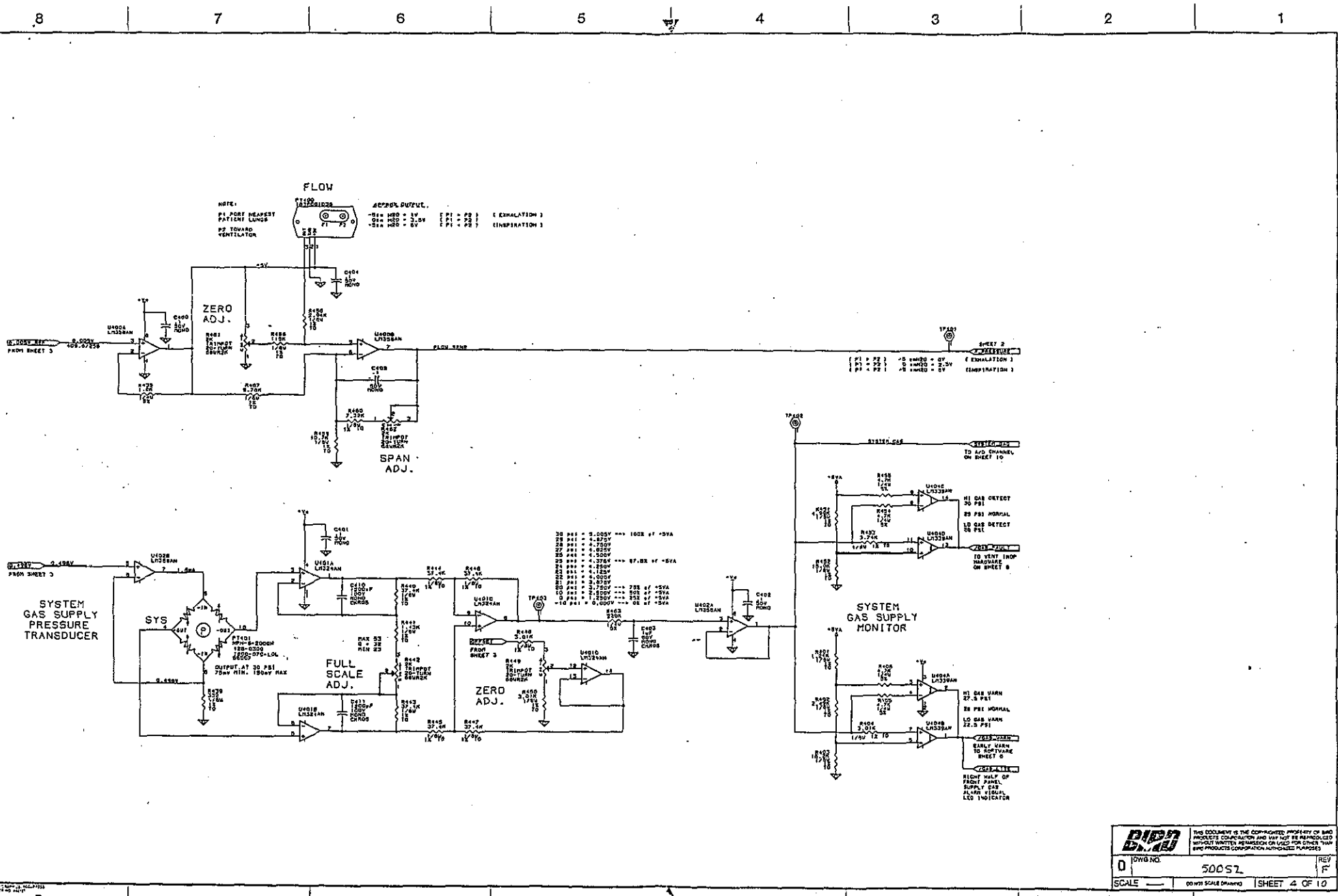
FLOW
ZERO ADJ.
SPAN ADJ.
SYSTEM GAS SUPPLY PRESSURE TRANSDUCER
SYS
FULL SCALE ADJ.
ZERO ADJ.
SYSTEM GAS SUPPLY MONITOR
TO A/D CHANNEL ON SHEET 10
TO VENT INOP HARDWARE ON SHEET 8
EARLY WARN TO SOFTWARE SHEET 8
RIGHT HALF OF FRONT PANEL SUPPLY GAS ALARM & GAUGE LED INDICATOR

DWG NO.	50052	REV F
SCALE —	DO NOT SCALE DRAWING	SHEET 4 OF 10

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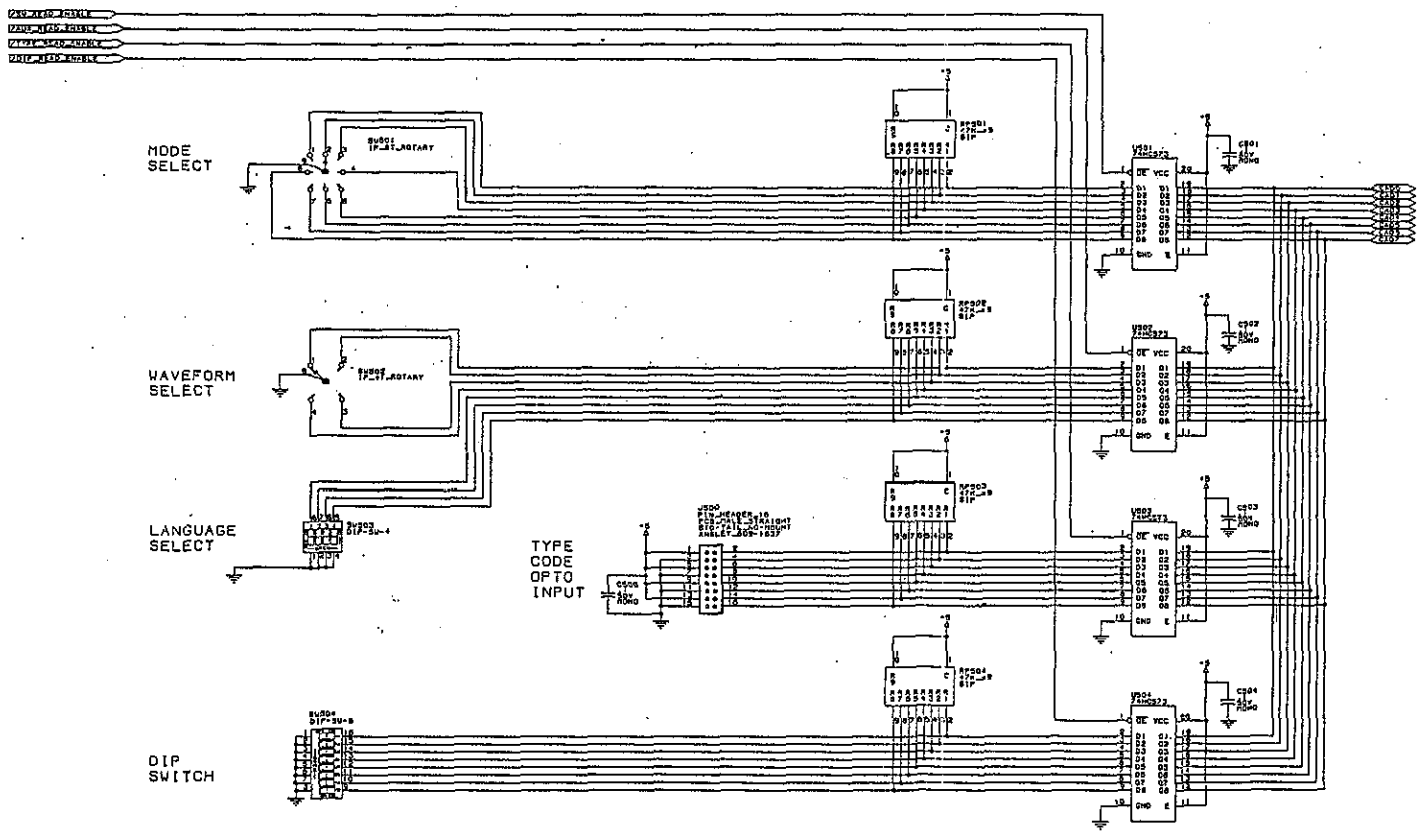

D	DWG NO. SC052	REV. F
SCALE —	DO NOT SCALE DRAWING	SHEET 5 OF 10

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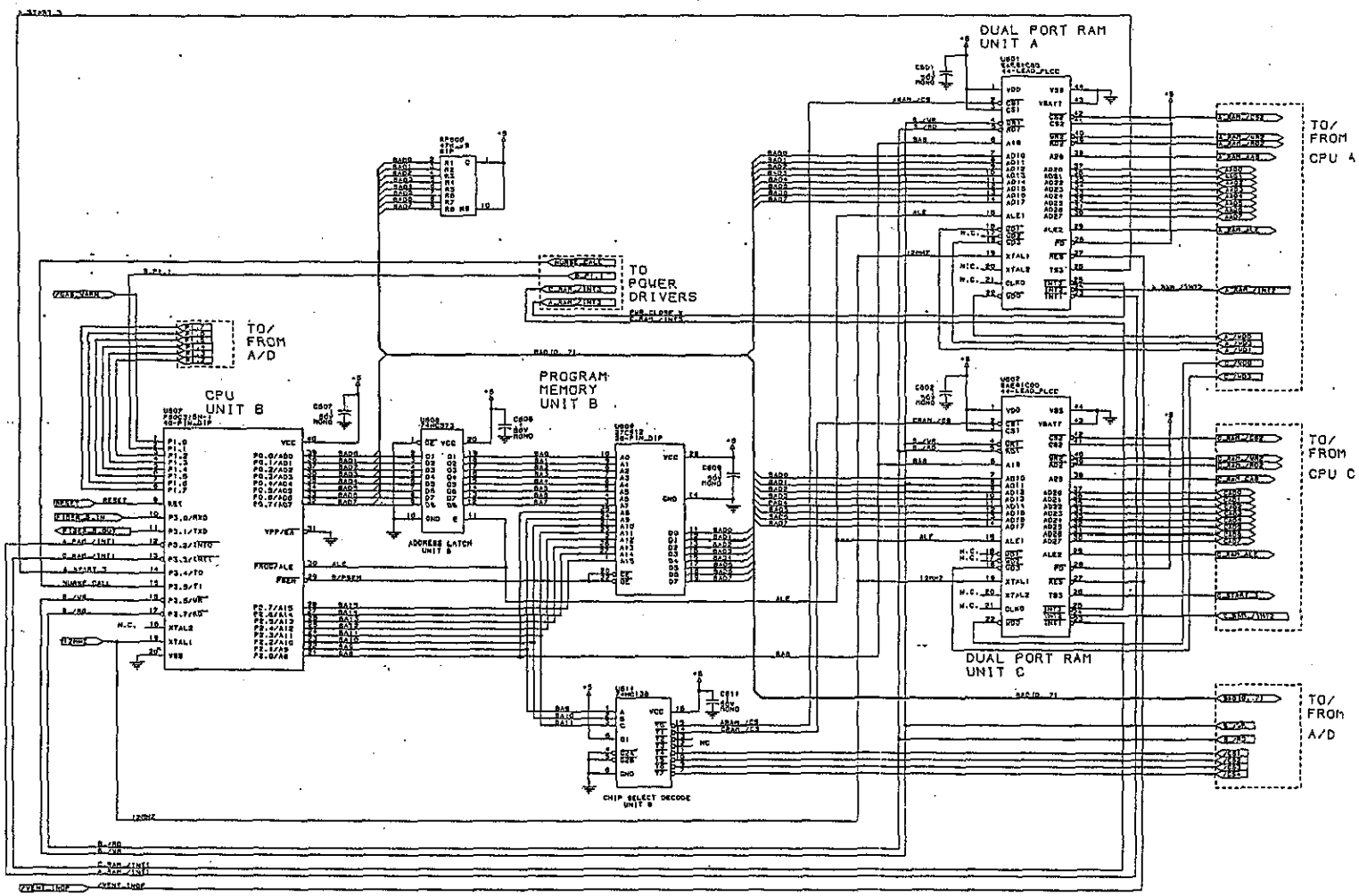
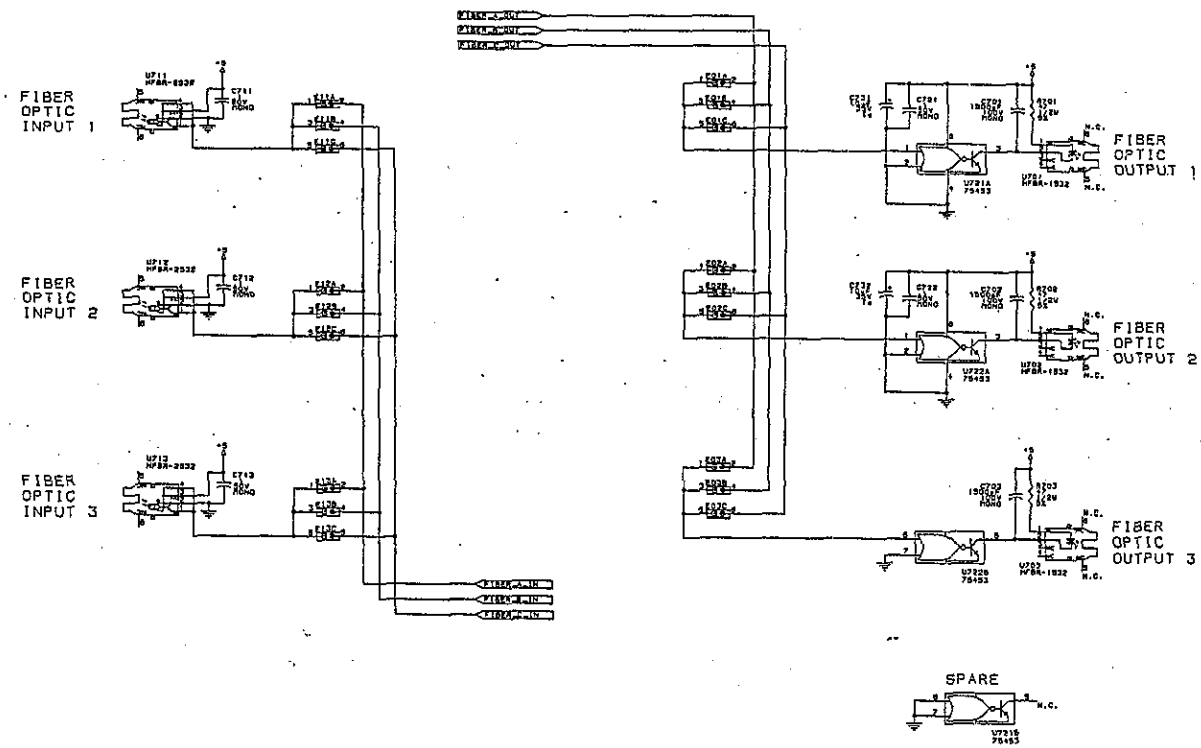


THIS DOCUMENT IS THE COPYRIGHTED PROPERTY OF BIPD PRODUCTS CORPORATION AND MAY NOT BE REPRODUCED WITHOUT WRITTEN PERMISSION OR USED FOR OTHER THAN BIPD PRODUCTS CORPORATION AUTHORIZED PURPOSES

D | DWG NO. SC052 | REV. F

SCALE — 1 DO NOT SCALE DRAWING | SHEET 6 OF 10



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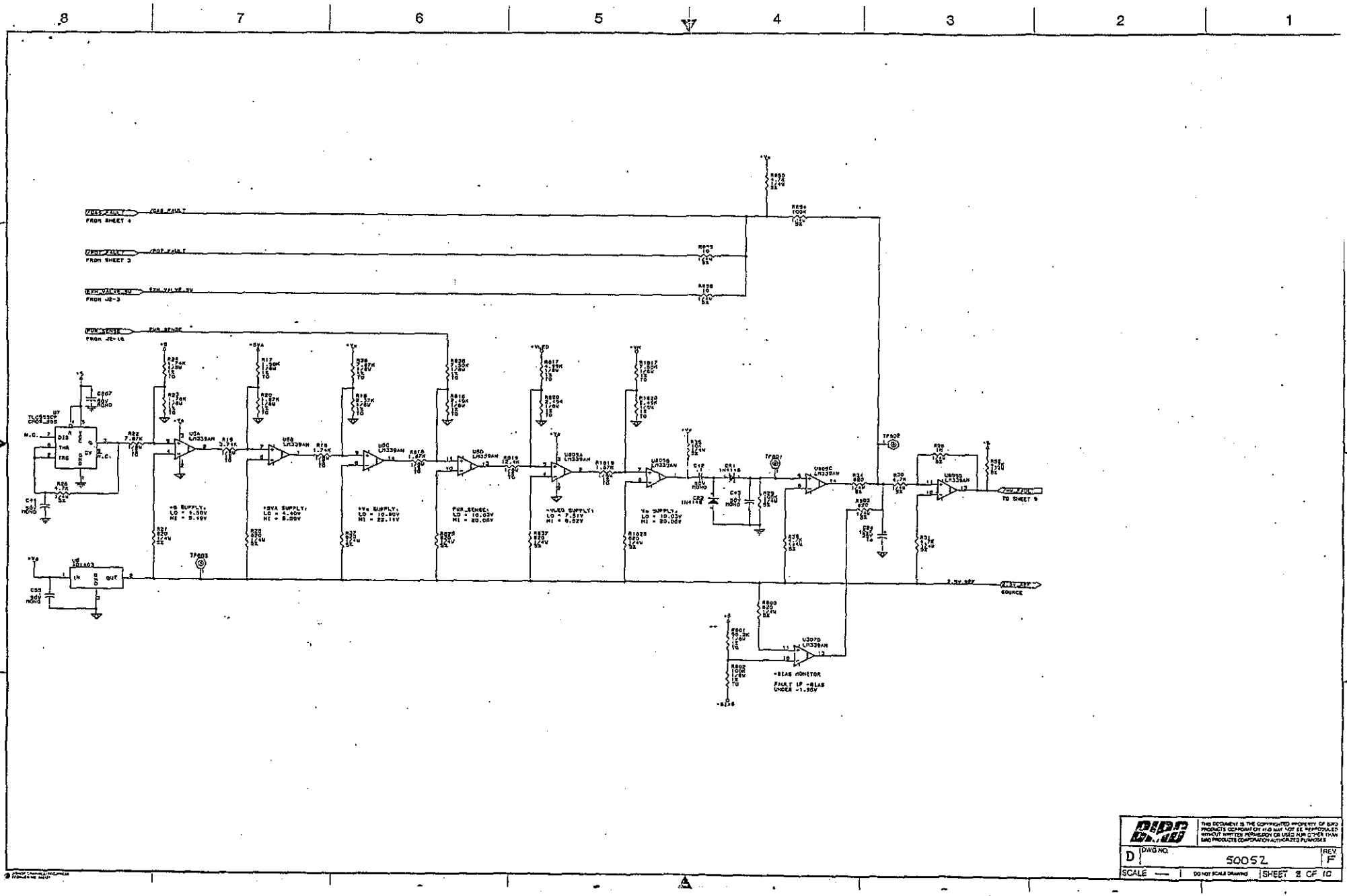
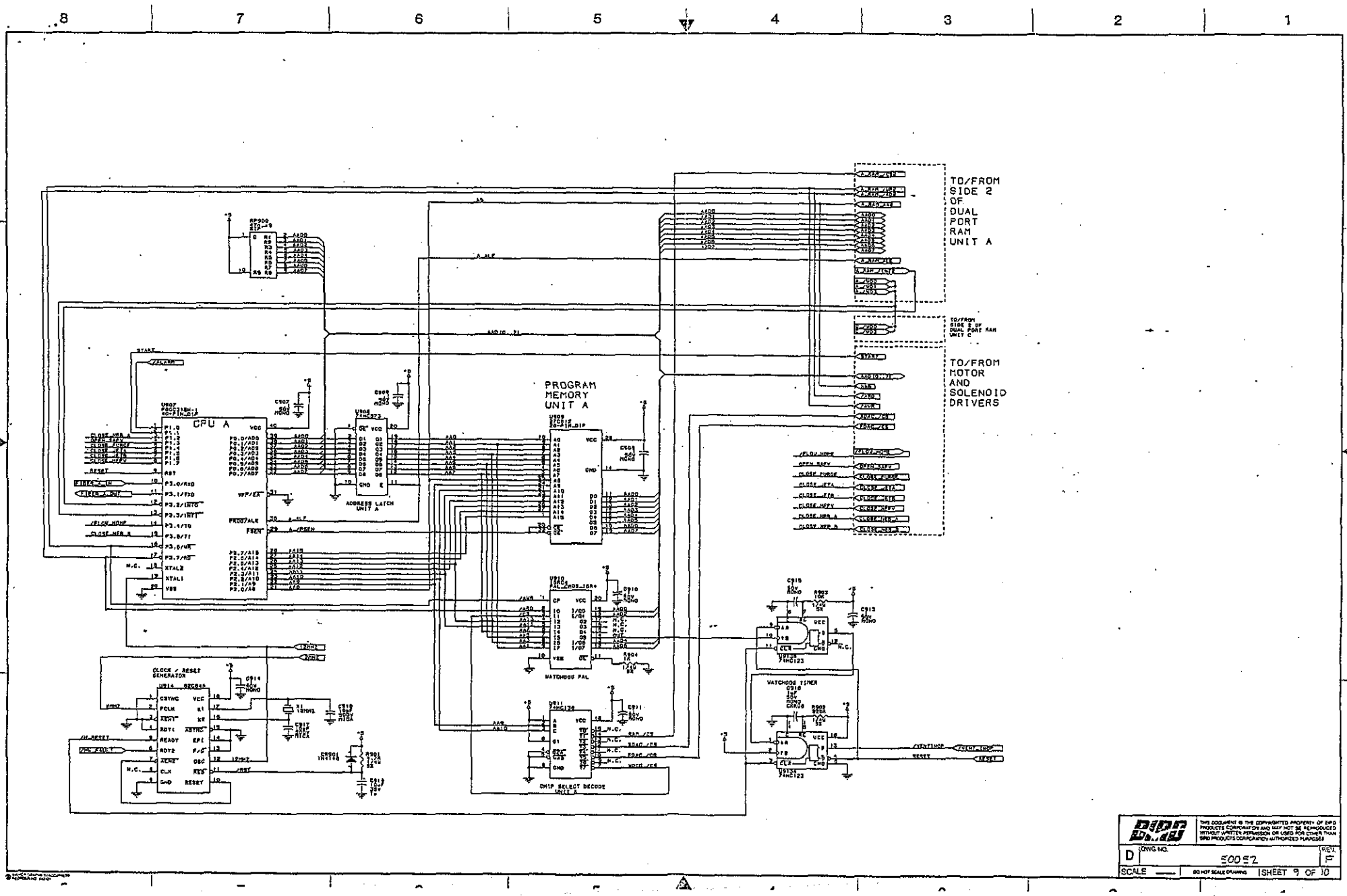
D	DWG NO. 50052	REV. F
SCALE —	DO NOT SCALE DRAWING	SHEET 7 OF 10


8
7
6
5
4
3
2
1
D
C
B
A
/GAS_FAULT
FROM SHEET 4
/POT_FAULT
FROM SHEET 3
EXH_VALVE_SV
FROM J2-3
PUR_SENSE
FROM J2-16
+5 SUPPLY:
LO = 5.00V
HI = 5.49V
+5VA SUPPLY:
LO = 4.40V
HI = 5.00V
+24 SUPPLY:
LO = 10.90V
HI = 22.11V
PUR_SENSE:
LO = 10.02V
HI = 20.00V
+VLED SUPPLY:
LO = 7.51V
HI = 9.02V
V+ SUPPLY:
LO = 10.00V
HI = 20.00V
-BIAS MONITOR
FAULT IF -BIAS
UNDER -1.30V
TO SHEET 9
SOURCE
DWG NO.
50052
REV
F
SCALE
DO NOT SCALE DRAWING
SHEET 2 OF 10


TO/FROM SIDE 2 OF DUAL PORT RAM UNIT A
TO/FROM SIDE 2 OF DUAL PORT RAM UNIT C
TO/FROM MOTOR AND SOLENOID DRIVERS
PROGRAM MEMORY UNIT A
CPU A
ADDRESS LATCH UNIT A
CLOCK / RESET GENERATOR
WATCHDOG TIMER
CHIP SELECT DECODE UNIT A
WATCHDOG PAL

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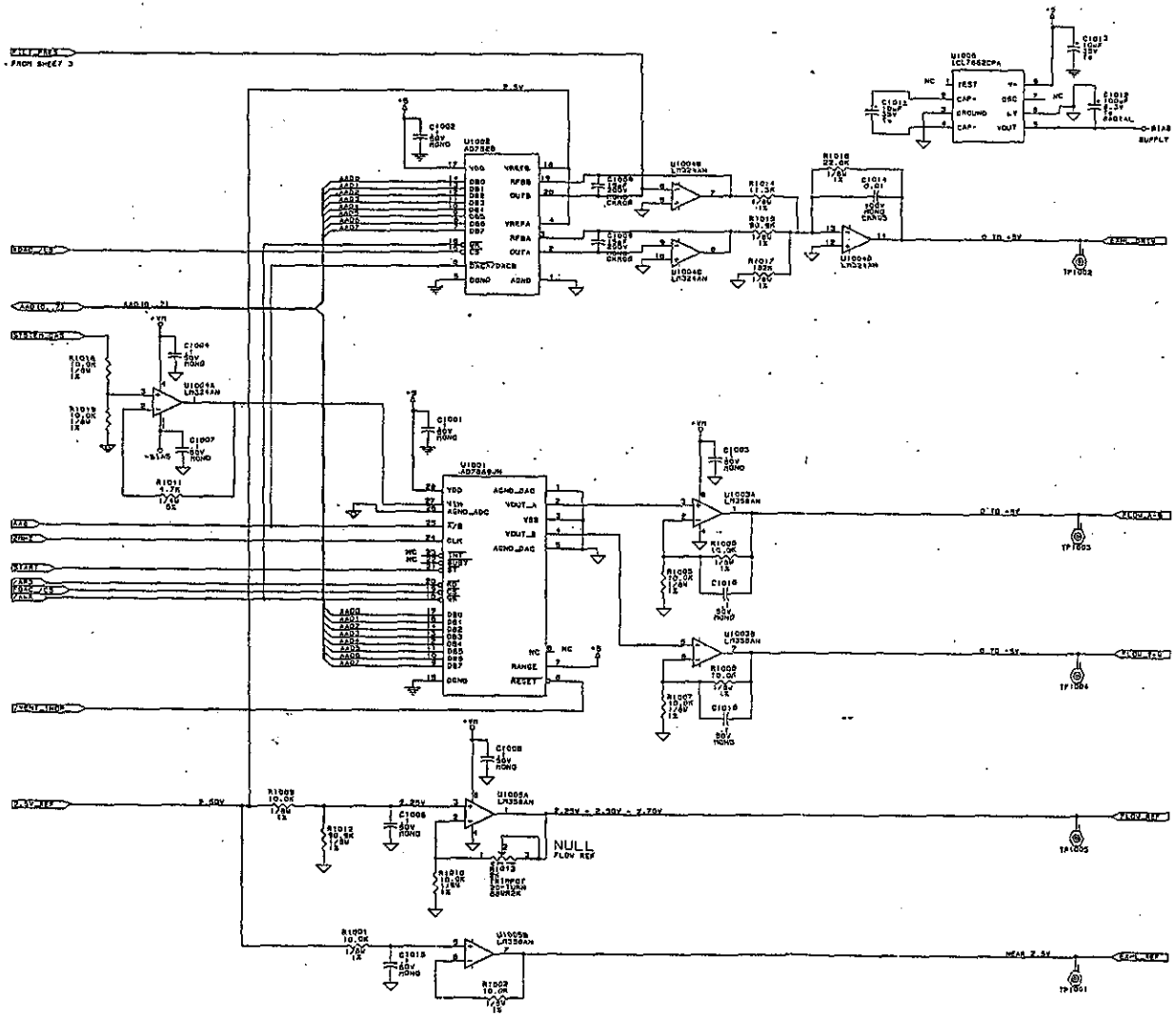
D	DWG NO. 5005 2	REV. F
SCALE ____	DO NOT SCALE DRAWING	SHEET 9 OF 10



D	DWG NO. 50052	REV. F	
SCALE	DO NOT SCALE DRAWING	SHEET 10 OF 10	

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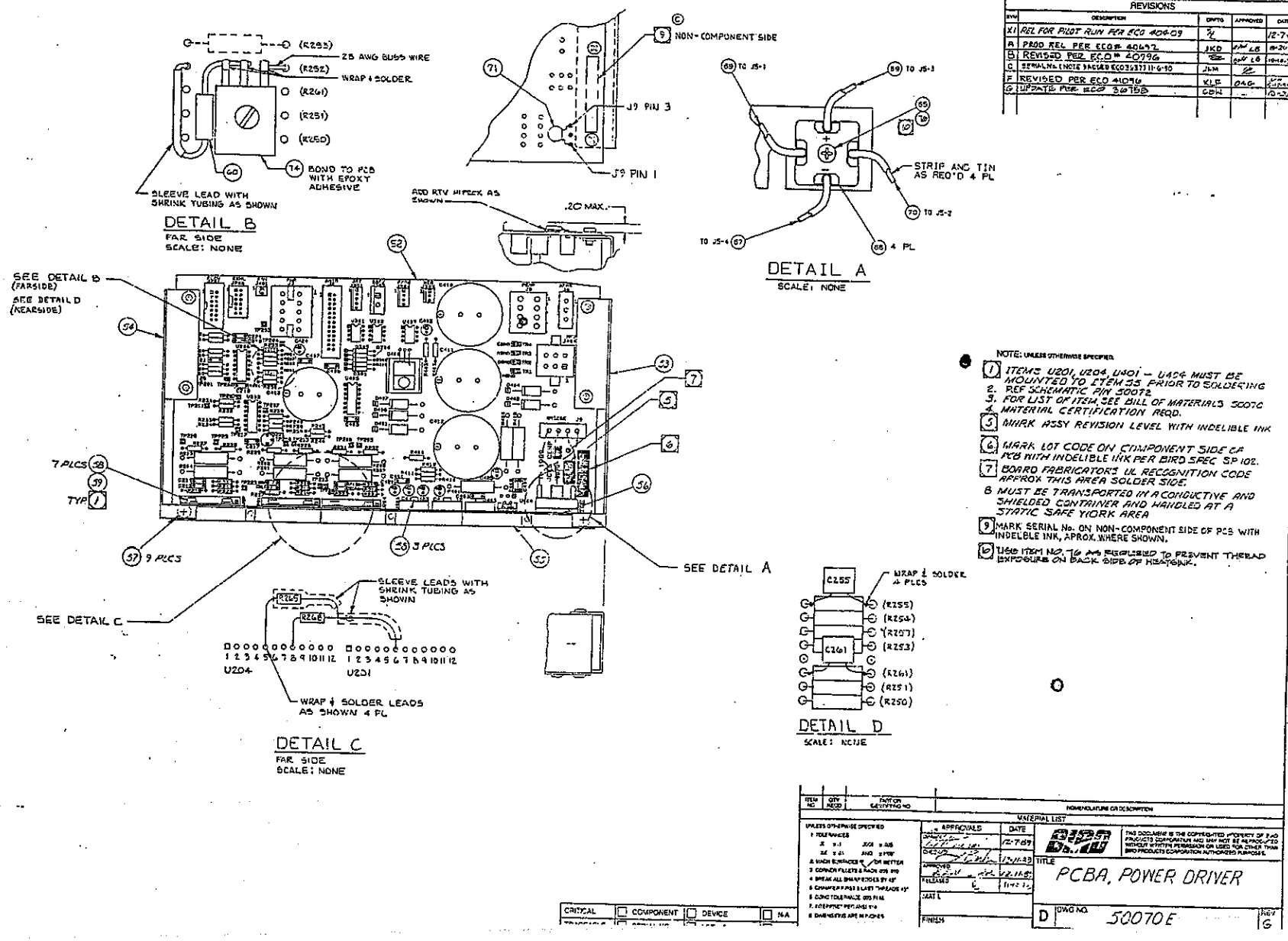
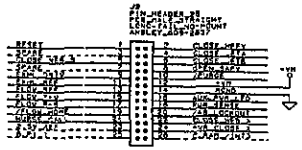
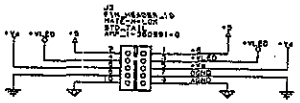

REVISIONS
DETAIL B
FAR SIDE
SCALE: NONE
DETAIL A
SCALE: NONE
DETAIL C
FAR SIDE
SCALE: NONE
DETAIL D
SCALE: NONE
NOTE: UNLESS OTHERWISE SPECIFIED.
SEE DETAIL A
SEE DETAIL B (FARSIDE)
SEE DETAIL C
SEE DETAIL D (NEARSIDE)
NON-COMPONENT SIDE
J9 PIN 3
J9 PIN 1
STRIP AND TIN AS REQ'D 4 PL
BOND TO PCB WITH EPOXY ADHESIVE
SLEEVE LEAD WITH SHRINK TUBING AS SHOWN
SLEEVE LEADS WITH SHRINK TUBING AS SHOWN
WRAP & SOLDER
WRAP & SOLDER LEADS AS SHOWN 4 PL
ADD RTV BEFORE AS SHOWN
.20 MAX.
7 PLCS
TYP
9 PLCS
3 PLCS
U204
U201
MATERIAL LIST
APPROVALS
DATE
TITLE
PCBA, POWER DRIVER
DWG NO.
50070E
REV
G
CRITICAL
COMPONENT
DEVICE
N/A

REVISIONS				
SYM	DESCRIPTION	DWN'D	APPROVED	DATE
X1	REL FOR PILOT RUN PER ECO 40540	R.P.H.	DWG	4/3/90
A	PRODUCTION RELEASE PER ECO #40796	EHL	LB/DWG	10/10/90
F	REVISED PER ECO 41029	J.K.D	DWG	3/27/91

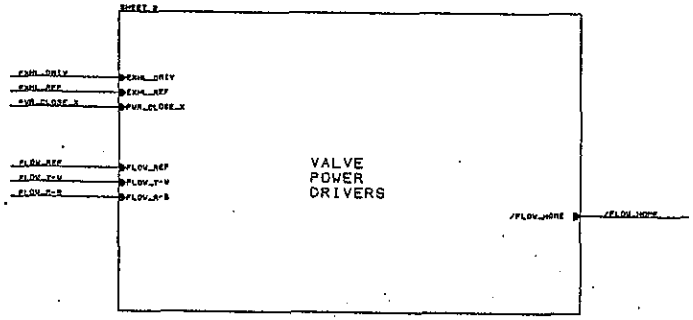
INTERCONNECT TO MAIN BOARD

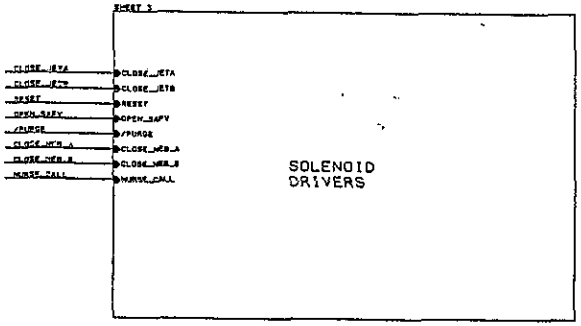


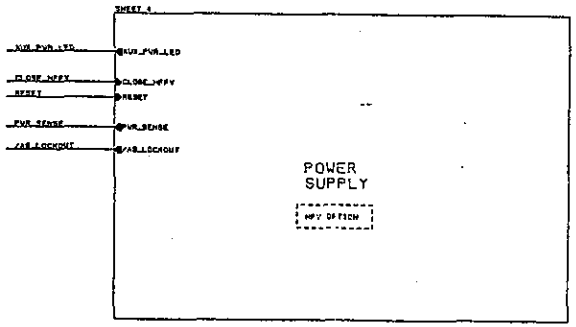
POWER TO MAIN BOARD



NOTE: UNLESS OTHERWISE SPECIFIED







MATERIAL LIST			
ITEM NO	QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES
2. MACH SURFACES 125 OR BETTER
3. CORNER FILLETS & RADII .005/.010
4. BREAK ALL SHARP EDGES
5. CHAMFER FIRST & LAST THREADS
6. DECIMAL TOLERANCE .XX ± .01
7. INTERPRET PER ANSI Y14
8. DIMENSIONS ARE IN INCHES

APPROVALS	DATE
DRAWN R. HAGEN	3-28-90
CHECKED L. BAKER	3-27-90
APPROVED D. GUILLAUME	4-3-90
RELEASED	
MFG'L	
FINISH	

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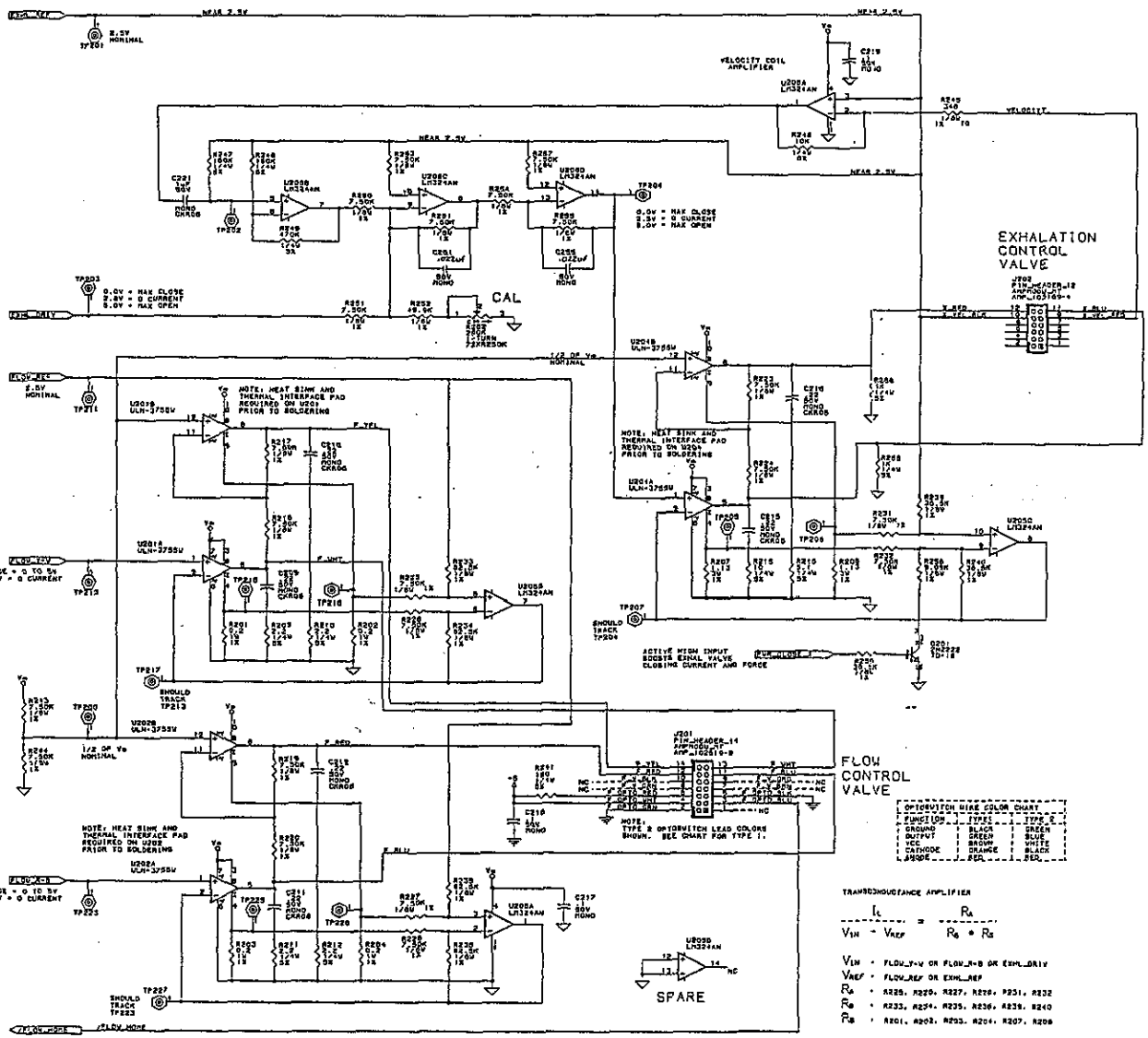
TITLE
SCHEMATIC
POWER DRIVER

D | DWG NO. 50072 | REV F

SCALE — | DO NOT SCALE DRAWING | SHEET 1 OF 4

CRITICAL	☐ COMPONENT	☐ DEVICE	☐ N/A
TRACEABLE	☐ SERIAL NO.	☐ LOT NO.	☐ N/A



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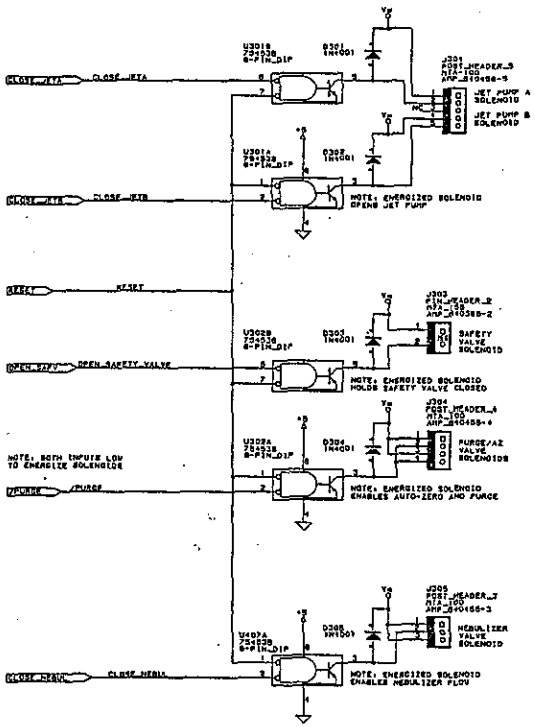
D	DWG NO. 50072	REV. F
SCALE	DO NOT SCALE DRAWING	SHEET 2 OF 4



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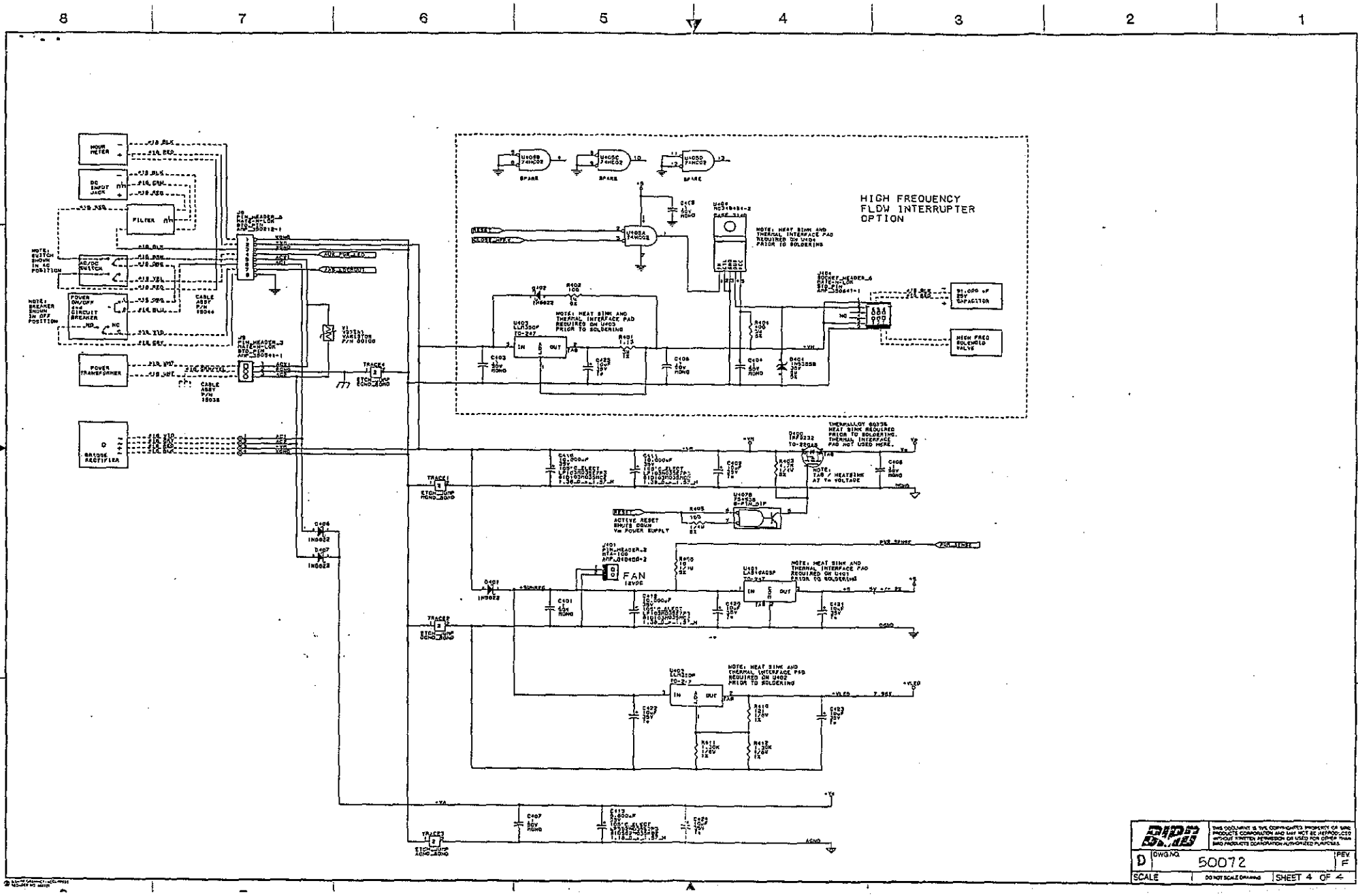
D	DWG NO. 50072	REV F
SCALE	DO NOT SCALE DRAWING	SHEET 3 OF 4


HIGH FREQUENCY
FLOW INTERRUPTER
OPTION
FAN
12VDC
HOUR METER
DC INPUT JACK
FILTER
AC/DC SWITCH
POWER ON/OFF CIRCUIT BREAKER
POWER TRANSFORMER
BRIDGE RECTIFIER
HIGH FREQ SOLENOID VALVE
ACTIVE RESET BRINGS DOWN Vm POWER SUPPLY
NOTE: HEAT SINK AND THERMAL INTERFACE PAD REQUIRED ON U402 PRIOR TO SOLDERING
NOTE: HEAT SINK AND THERMAL INTERFACE PAD REQUIRED ON U403 PRIOR TO SOLDERING
NOTE: HEAT SINK AND THERMAL INTERFACE PAD REQUIRED ON U501 PRIOR TO SOLDERING
NOTE: HEAT SINK AND THERMAL INTERFACE PAD REQUIRED ON U502 PRIOR TO SOLDERING
NOTE: TAB / HEATSINK AT Vm VOLTAGE
THERMALLOY 6073B HEAT SINK REQUIRED PRIOR TO SOLDERING. THERMAL INTERFACE PAD NOT USED HERE.
SPARE
SPARE
SPARE
AGND
DGND

D	DWG NO. 50072	REV F
SCALE	DO NOT SCALE DRAWING	SHEET 4 OF 4

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REVISIONS				
ITM	DESCRIPTION	DRAFTD	APPROVED	DATE
A	PROD REL PER ECO# 41171	JKD	DWG	8.14.91
B	REVISED PER ECO# 50881	JKD		
C	REVISED PER ECO# 51835	JKD		
D	REVISED PER ECO# 50846	JKD		12.19.91
E	REVISED PER ECO# 50846	JKD		1.15.92
F	REVISED PER ECO# 50846	JKD		1.23.92
G	REVISED PER ECO# 50896	JKD		1.29.92

ASSEMBLY CONFIGURATION BLOCK

THIS PCB ASSEMBLY CONSISTS OF THE FOLLOWING:

PCB ASSY	50160	REV A	REV B	REV C	REV D	REV E	REV F	REV G
ASSY BOM	50160	REV A	REV B	REV C	REV D	REV E	REV F	REV G
PCB FAB	50161	REV A	REV A	REV A	REV B	REV B	REV B	REV B
SCHEMATIC	50162	REV A	REV A	REV A	REV B	REV B	REV B	REV B
ARTWORK	50163	REV A	REV A	REV A	REV A	REV A	REV A	REV A
CHG CODE	○= MANDITORY □= PHASE-IN △= RECORD		○	△	○	○	○	○

NOTE: UNLESS OTHERWISE SPECIFIED

1. REFERENCE SCHEMATIC 50162
2. FOR LIST OF ITEMS REFERENCE BILL OF MATERIALS 50160
3. U201, U202, U204, U401 - U403 MUST BE MOUNTED TO HEAT SINKING RAIL (ITEM 55) PRIOR TO SOLDERING
4. APPLY S1011 (VIBRA-TITE THD SEALANT) TO ALL FASTENER THREADS PRIOR TO ASSY
5. SOLDER PER IPC-A-610, CLASS 3
6. ALL LEADS TO BE TRIMMED TO .06 MAX
7. BOARD FABRICATOR'S UL RECOGNITION CODE TO BE MARKED ON SOLDER SIDE OF BOARD, USING WHITE INDELIBLE INK
8. ASSEMBLY REVISION, DATE CODE AND SERIAL NUMBER TO BE MARKED IN APPROPRIATE AREA ON SOLDER SIDE OF ASSEMBLY USING BLACK, INDELIBLE INK
9. ASSEMBLY TO BE PACKAGED AND TRANSPORTED IN A CONDUCTIVE AND SHIELDED CONTAINER AND HANDLED IN A STATIC SAFE WORK AREA

(10) END OF MOUNTING SCREW NOT TO PROTRUDE THRU HEATSINK.

ITM NO	QTY REQ	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION

MATERIAL LIST

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES
2. MACH SURFACES 125 OR BETTER
3. CORNER FILLETS R .XXX (XX)
4. BREAK ALL SHARP EDGES .01 x 45°
5. CHAMFER FIRST 5 LAST THREADS 15°
6. CONC TOLERANCE .005 TIR
7. INTERPRET PER ANSI Y14.5
8. DIMENSIONS ARE IN INCHES

APPROVALS	DATE
DRAWN J.K. PACK	8.1.91
CHECKED J.K. PACK	8.1.91
APPROVED D. GUILLAUME	8.1.91
RELEASED D. LAWLOR	8.16.91
MAT'L	
FINISH	

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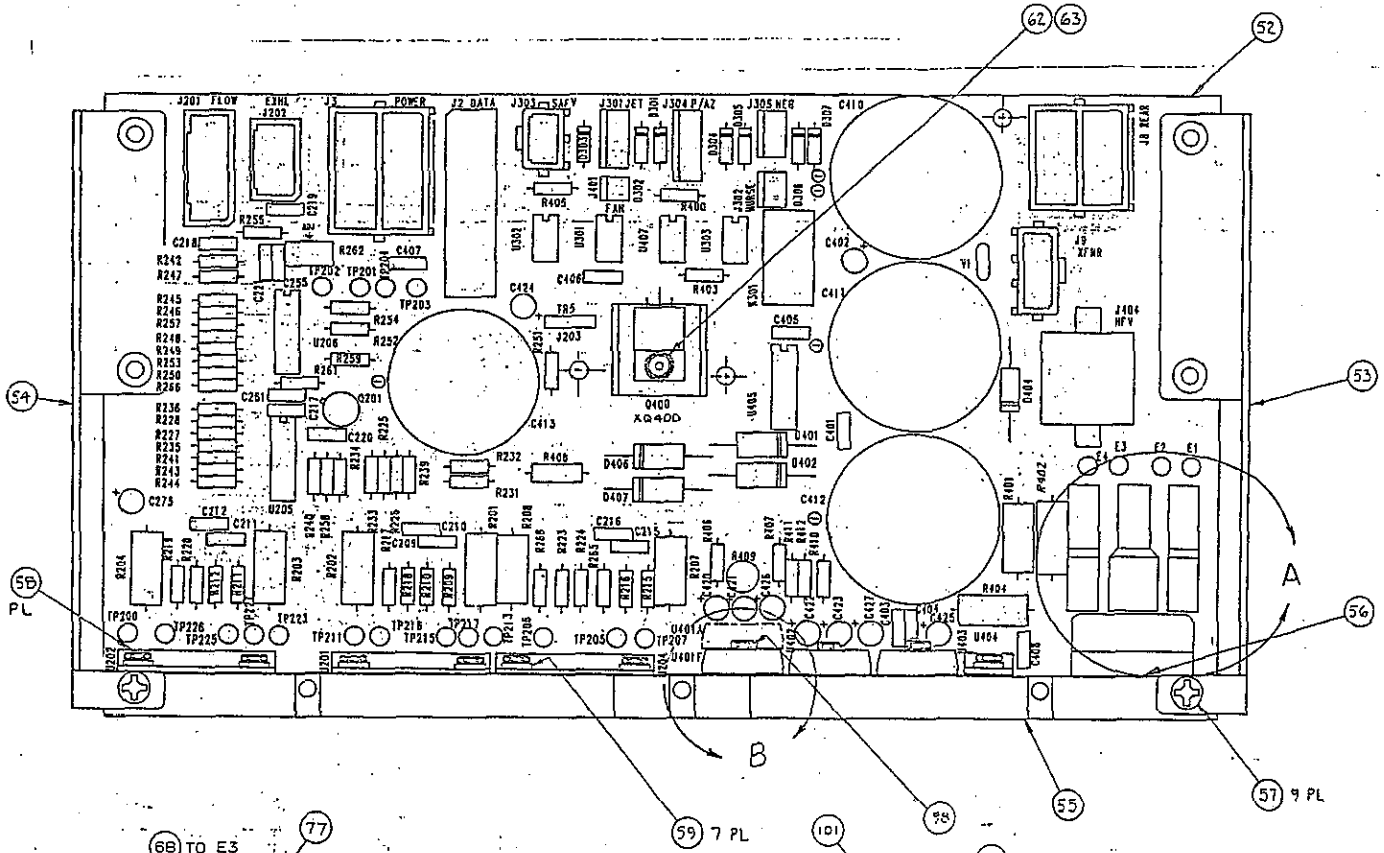
DATA PRODUCTS

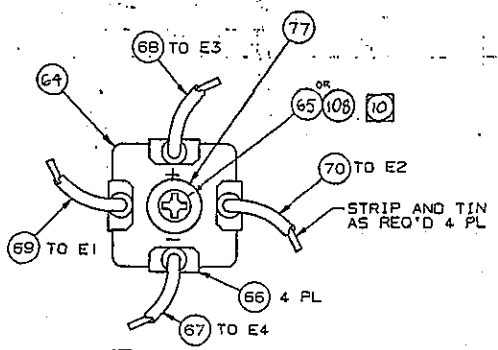
TITLE: PCBA, POWER DRIVER

D | DWG NO. 50160E | REV G

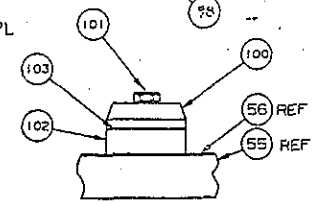
SCALE 2/1 | DO NOT SCALE DRAWING | SHEET 1 OF 2

CRITICAL	☒ COMPONENT	☐ DEVICE	☐ N/A
TRACEABLE	☒ SERIAL NO.	☒ LOT NO.	☐ N/A





DETAIL A
SCALE: NONE



DETAIL B
SCALE: NONE
OPTIONAL CONFIGURATION USING ADJUSTABLE REGULATOR U401A

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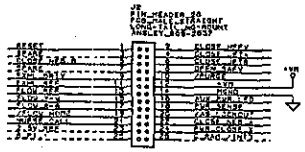
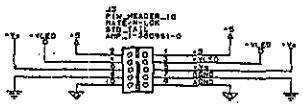
D	DWG NO. 50160E	REV D

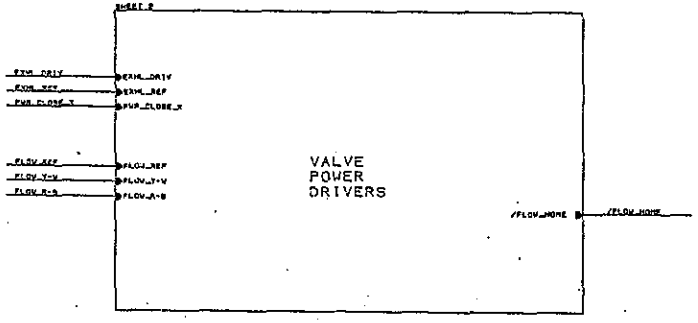
REVISIONS				
SYM	DESCRIPTION	DWN'D	APPROVED	DATE
A	PROD RSL PER ECO # 4113D	JKD	DWC	3.14.91
B	REVISED PER ECO # 50846	JKD		

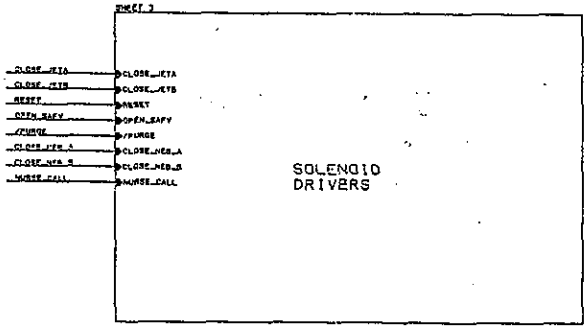
INTERCONNECT TO MAIN BOARD

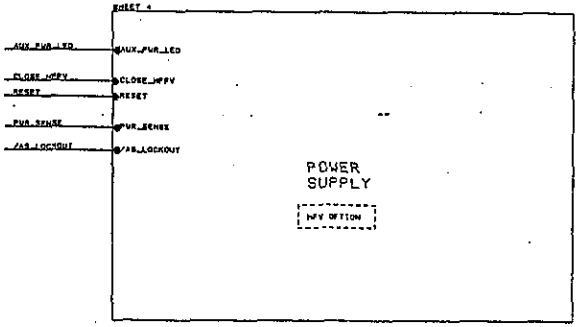


POWER TO MAIN BOARD









NOTE: UNLESS OTHERWISE SPECIFIED.

1. REVISION STATUS CHANGES TO THIS DRAWING MUST BE REFLECTED ON DRAWING 50160E.

REV NO	QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION

MATERIAL LIST

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES
X ±.1 XXX ±.005
XX ±.01 ANG ±1°
2. MACH SURFACES 125 BETTER
3. CORNER FILLETS & RADII .010 R'D
4. BREAK ALL SHARP EDGES .01 x 45°
5. CHAMFER FIRST & LAST 1-HEADS 45°
6. DIMENSIONS ARE IN INCHES

APPROVALS	DATE
DRAWN L. BAKER	6/6/91
CHECKED	6/6/91
APPROVED	6/10/91
RELEASED	
MATL	
FINISH	

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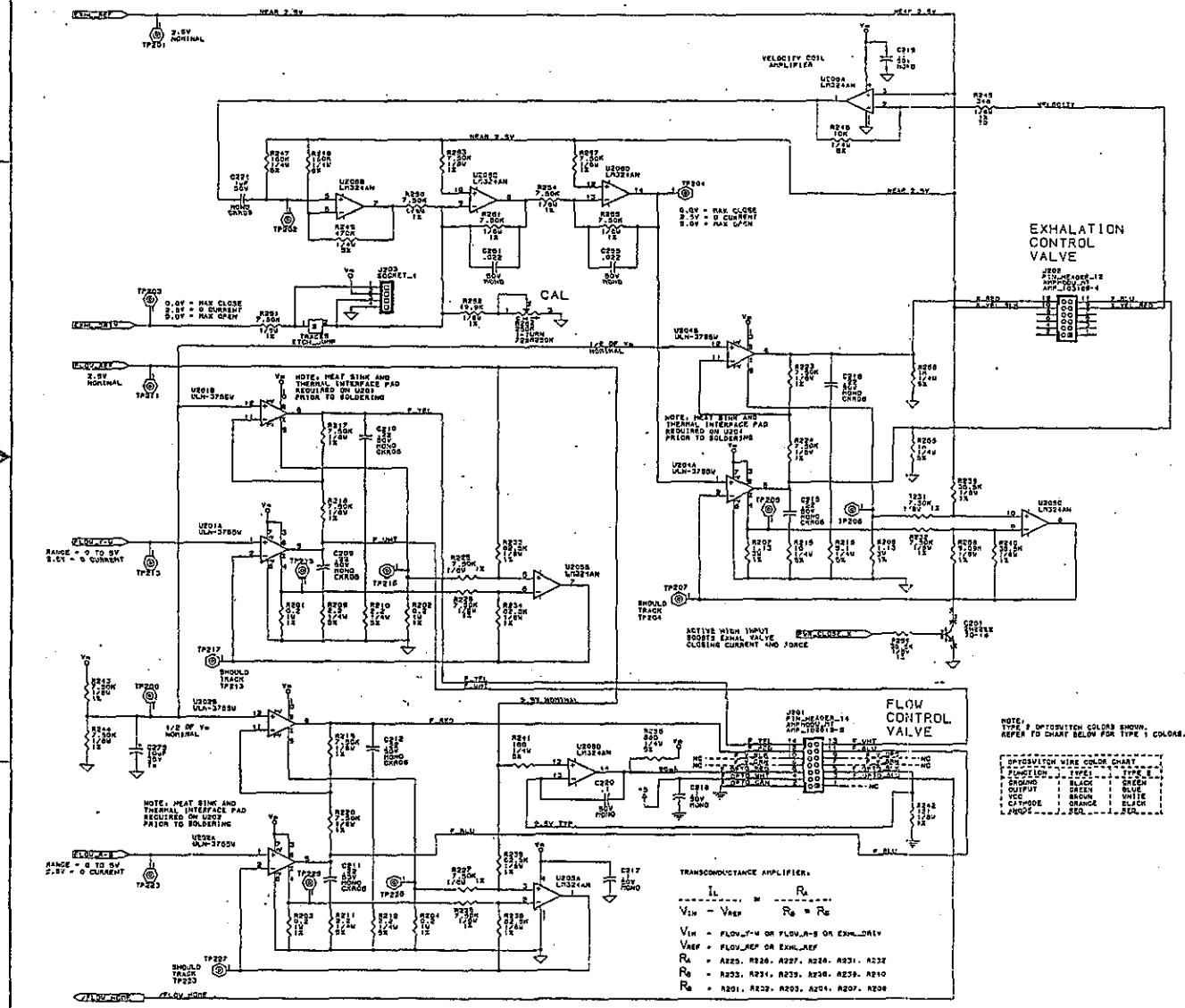
TITLE
SCHEMATIC,
POWER DRIVER

D | DWG NO. 50162 | REV B

SCALE NONE | DO NOT SCALE DRAWING | SHEET 1 OF 4

CRITICAL	☐ COMPONENT	☐ DEVICE	☐ N/A
TRACEABLE	☐ SERIAL NO.	☐ LOT NO.	☐ N/A


EXHALATION CONTROL VALVE
FLOW CONTROL VALVE
CAL
VELOCITY COIL AMPLIFIER
TRANSCONDUCTANCE AMPLIFIER:
NOTE: HEAT SINK AND THERMAL INTERFACE PAD REQUIRED ON U201 PRIOR TO SOLDERING
NOTE: TYPE 2 OPTOSWITCH COLORS SHOWN. REFER TO CHART BELOW FOR TYPE 1 COLORS.
OPTOSWITCH WIRE COLOR CHART
FUNCTION | TYPE1 | TYPE 2
GROUND | BLACK | GREEN
OUTPUT | GREEN | BLUE
VCC | BROWN | WHITE
CATHODE | ORANGE | BLACK
ANODE | RED | RED

D	DWG NO. 50162	REV E	
SCALE NONE	SHEET	OF	

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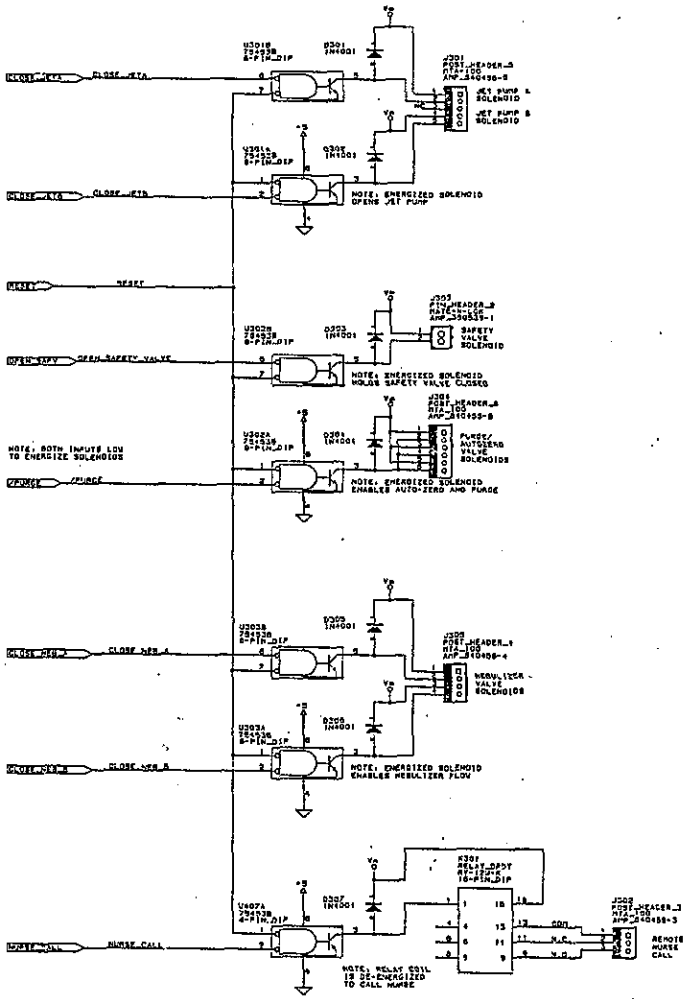
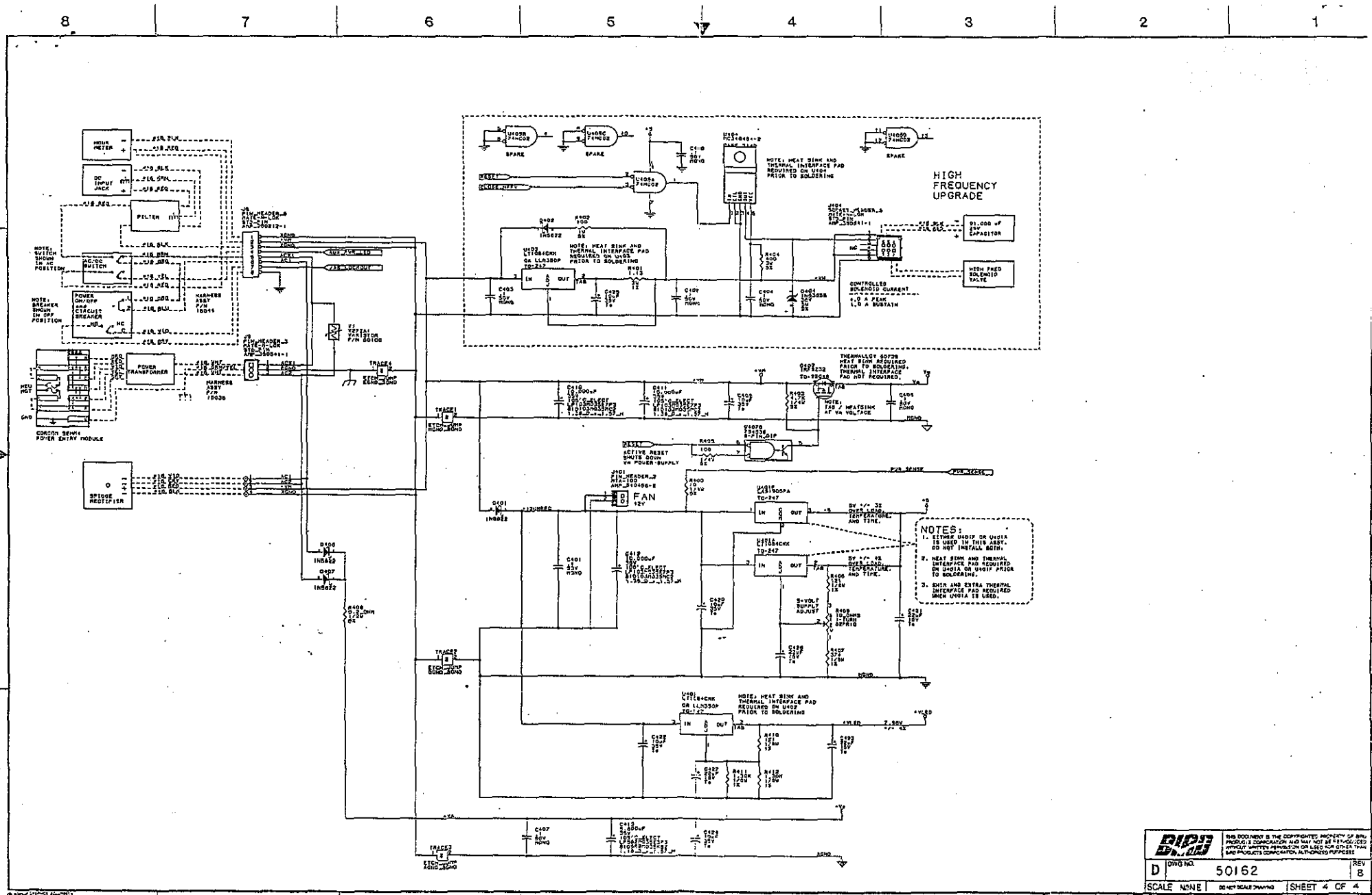

NOTE: ENERGIZED SOLENOID OPENS JET PUMP
NOTE: ENERGIZED SOLENOID HOLDS SAFETY VALVE CLOSED
NOTE: BOTH INPUTS LOW TO ENERGIZE SOLENOIDS
NOTE: ENERGIZED SOLENOID ENABLES AUTO-ZERO AND PURGE
NOTE: ENERGIZED SOLENOID ENABLES NEBULIZER FLOW
NOTE: RELAY COIL IS DE-ENERGIZED TO CALL NURSE

D	DWG NO. 50162	REV B
SCALE NONE		SHEET 3 OF 4


HIGH FREQUENCY UPGRADE
FAN
NOTES:
1. EITHER U401F OR U401A IS USED IN THIS ASSY. DO NOT INSTALL BOTH.
2. HEAT SINK AND THERMAL INTERFACE PAD REQUIRED ON U401A OR U401F PRIOR TO SOLDERING.
3. SHIM AND EXTRA THERMAL INTERFACE PAD REQUIRED WHEN U401A IS USED.

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D	DWG NO. 50162	REV 8
SCALE NONE	DO NOT SCALE DRAWING	SHEET 4 OF 4

ASSEMBLY CONFIGURATION BLOCK

THIS PCB ASSEMBLY CONSISTS OF THE FOLLOWING:

PCB ASSY	50250	REV X1	REV X2	REV A	REV B	REV	REV	REV
ASSY BOM	50250	REV X1	REV X2	REV A	REV B	REV	REV	REV
PCB FAB	50041	REV D	REV D	REV D	REV D	REV	REV	REV
SCHEMATIC	50042	REV B	REV B	REV B	REV B	REV	REV	REV
ARTWORK	50043	REV C	REV C	REV C	REV C	REV	REV	REV
CHG CODE	○ = MANDITORY □ = PHASE-IN △ = RECORD		△	△	△			

REVISIONS				
SYM	DESCRIPTION	ORIG	APPROVED	DATE
A	RELEASE FOR PRODUCTION PER ECO# 50307	ADV		7/11/92
B	INCORP PER ECO 51853	EHL		11-2-95

NOTE: UNLESS OTHERWISE SPECIFIED

1. *REFERENCE SCHEMATIC 50042*
2. FOR LIST OF ITEMS REFERENCE BILL OF MATERIALS 50250
3. MATERIAL CERTIFICATION REQUIRED
4. MARK ASSY REVISION LEVEL WITH INDELIBLE INK ON LABEL.
5. MARK LOT CODE ON COMPONENT SIDE OF PCB WITH INDELIBLE INK PER BIRD ENG. SPEC SP102 ON LABEL.
6. BOARD FABRICATOR'S UL RECOGNITION CODE TO BE MARKED ON SOLDER SIDE OF BOARD, USING WHITE INDELIBLE INK, APPROX THIS AREA.
7. DOME SWITCHES, SW200-SW207 TO BE MOUNTED CONCENTRIC ON CONTACT PADS WITHIN .020 ON ALL SIDES USING P/N 03431 CLEAR TAPE.
8. ASSEMBLY TO BE PACKAGED AND TRANSPORTED IN A CONDUCTIVE AND SHIELDED CONTAINER AND HANDLED IN A STATIC SAFE WORK AREA
9. LUMINOUS INTENSITY CODE CATEGORY MUST BE THE SAME THROUGHOUT EACH PCB ASSY.
10. ALL LEADS TO BE TRIMMED TO .06 MAX
11. SOLDER PER IPC-A-610
12. MARK SERIAL NO. ON COMPONENT SIDE OF PCB WITH INDELIBLE INK APPROX. WHERE SHOWN.
13. LCD AND LED HEIGHT .490-.510
14. PROGRAMMED EPROM IS INSTALLED AT FINAL ASSEMBLY.
15. PCB MAY USE A 50040 PCBA MODIFIED TO 50250 REQUIREMENTS.
16. MARK LABEL WITH P/N 50250, REV --, AND LOT CODE APPROX .125 HIGH IN INDELIBLE INK. MOUNT APPROX. WHERE SHOWN.

ITEM NO. | QTY PER | PART OR IDENTIFYING NO. | NOMENCLATURE OR DESCRIPTION

MATERIAL LIST

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES
2. MACH SURFACES
3. CORNER FILLETS
4. BREAK ALL SHARP EDGES
5. CHAMFER FIRST & LAST THREADS
6. CONG TOLERANCE
7. WITHHELD PER
8. DIMENSIONS ARE IN

APPROVALS	DATE
DRAWN A.D. WATKINS	8.18.92
CHECKED	4.30.92
APPROVED	
RELEASED	7/11/92
MATL	
FINISH	

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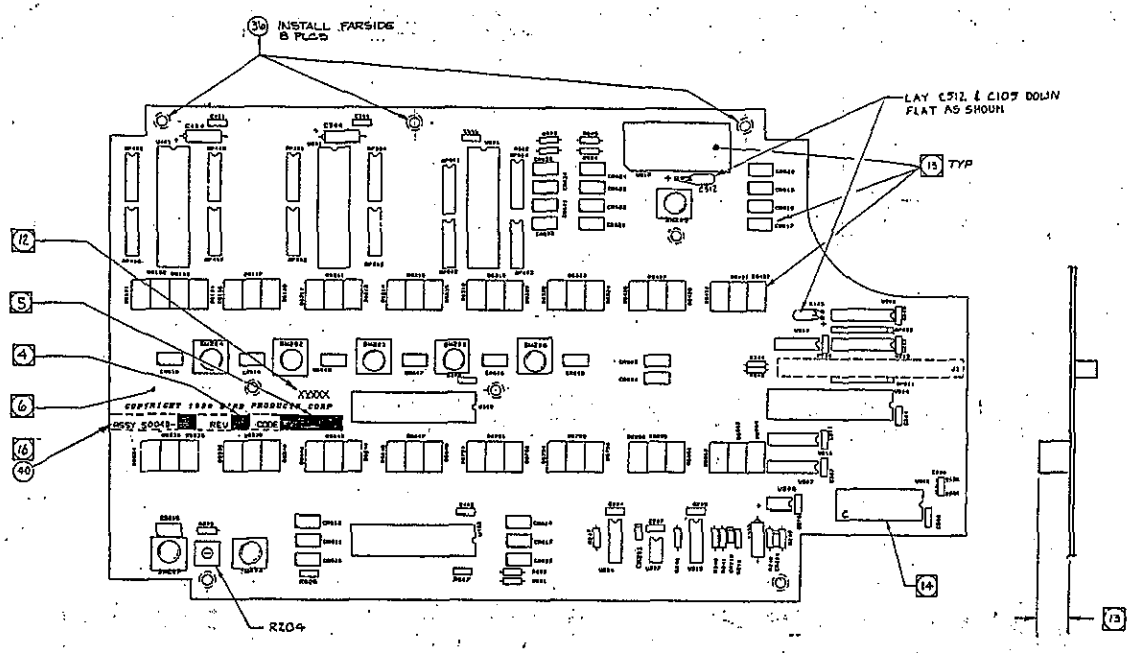
TITLE: PCBA, DISPLAY FLOW SYNCH.

D | DWG NO. 50250E | REV B

SCALE 2/1 | DO NOT SCALE DRAWING | SHEET 1 OF 2

CRITICAL | ☒ COMPONENT | ☐ DEVICE | ☐ N/A



D	DWG NO. 50250E	REV. B	

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ASSEMBLY CONFIGURATION BLOCK

THIS PCB ASSEMBLY CONSISTS OF THE FOLLOWING:

PCB ASSY	50260	REV X1	REV X2	REV A	REV B	REV C	REV D	REV
ASSY BOM	50260	REV X1	REV X2	REV A	REV B	REV C	REV D	REV
PCB FAB	50051	REV C	REV C	REV C	REV C	REV C	REV C	REV
SCHEMATIC	50052	REV F	REV F	REV F	REV F	REV F	REV F	REV
ARTWORK	50053	REV C	REV C	REV C	REV C	REV C	REV C	REV
CHG CODE	○= MANDITORY □= PHASE-IN △= RECORD		△	△	○	○	△	

REVISIONS

SYM	DESCRIPTION	DWN'D	APPROVED	DATE
A	RELEASE FOR PRODUCTION PER ECO# 56397	EHL	JLM	7/11/-
B	INCORP PER ECO 51835	EHL	-JLM	11-2-92

NOTE: UNLESS OTHERWISE SPECIFIED.

1. PADS FOR INDICATED COMPONENTS ARE TO BE FREE FROM SOLDER.
2. REFERENCE SCHEMATIC 50052
3. FOR LIST OF ITEMS REFERENCE BILL OF MATERIALS 50260
4. MATERIAL CERTIFICATION REQUIRED
5. MARK ASSY REVISION LEVEL WITH INDELIBLE INK ON LABEL.
6. MARK LOT CODE ON COMPONENT SIDE OF PCB WITH INDELIBLE INK PER BIRD ENG. SPEC SP182 ON LABEL.
7. BOARD FABRICATOR'S UL RECOGNITION CODE TO BE MARKED ON SOLDER SIDE OF BOARD, USING WHITE INDELIBLE INK, APPROX THIS AREA.
8. RETAIN HARDWARE SUPPLIED WITH POTENTIOMETERS P/N 83265 AND PACKAGE WITH FINAL ASSY. 1/4-32 (P/N 83281); 1/4-32 JAM NUT (P/N 83282).
9. ASSEMBLY TO BE PACKAGED AND TRANSPORTED IN A CONDUCTIVE AND SHIELDED CONTAINER AND HANDLED IN A STATIC SAFE WORK AREA.
10. ALL LEADS TO BE TRIMMED TO .06 MAX
11. INSTALL XDUCERS PT 381-PT 383 & PT 481 AFTER WAVE SOLDERING. XDUCERS MUST BE PROTECTED FROM CLEANERS & SOLVENTS.
12. SOLDER PER IPC-A-610
13. COMPONENTS ARE MARKED WITH A DOT APPROX WHERE SHOWN IN COLOR AS FOLLOWS: (FOR REF. ONLY) P/N 58887 (PT 481)-RED DOT P/N 58888 (PT 382, PT381)-BLUE DOT P/N 58821 (PT431)-YELLOW DOT.
14. MARK SERIAL NUMBER ON COMPONENT SIDE OF PCB WITH INDELIBLE INK APPROXIMATELY WHERE SHOWN.
15. PROGRAMMED EPROM IS INSTALLED AT FINAL ASSEMBLY.
16. PCB MAY USE A 50258 PCBA MODIFIED TO 50260 REQUIREMENTS.
17. MARK LABEL WITH P/N 50260, REV-- AND LOT CODE APPROX. .125 HIGH WITH INDELIBLE INK, MOUNT APPROX. WHERE SHOWN.

ITEM NO	QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION

MATERIAL LIST

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES
2. MACH SURFACES 63 OR BETTER
3. CORNER FILLETS R PADS
4. BREAK ALL SHARP EDGES BY
5. CHAMFER FIRST & LAST THREADS
6. CONC TOLERANCE
7. FINISH PER
8. DIMENSIONS ARE IN INCHES

APPROVALS	DATE
DRAWN EH LIVESAY	6.19.92
CHECKED JLM	6.30.92
APPROVED	7/11/92
RELEASED	7/11/92
MAT'L	
FINISH	

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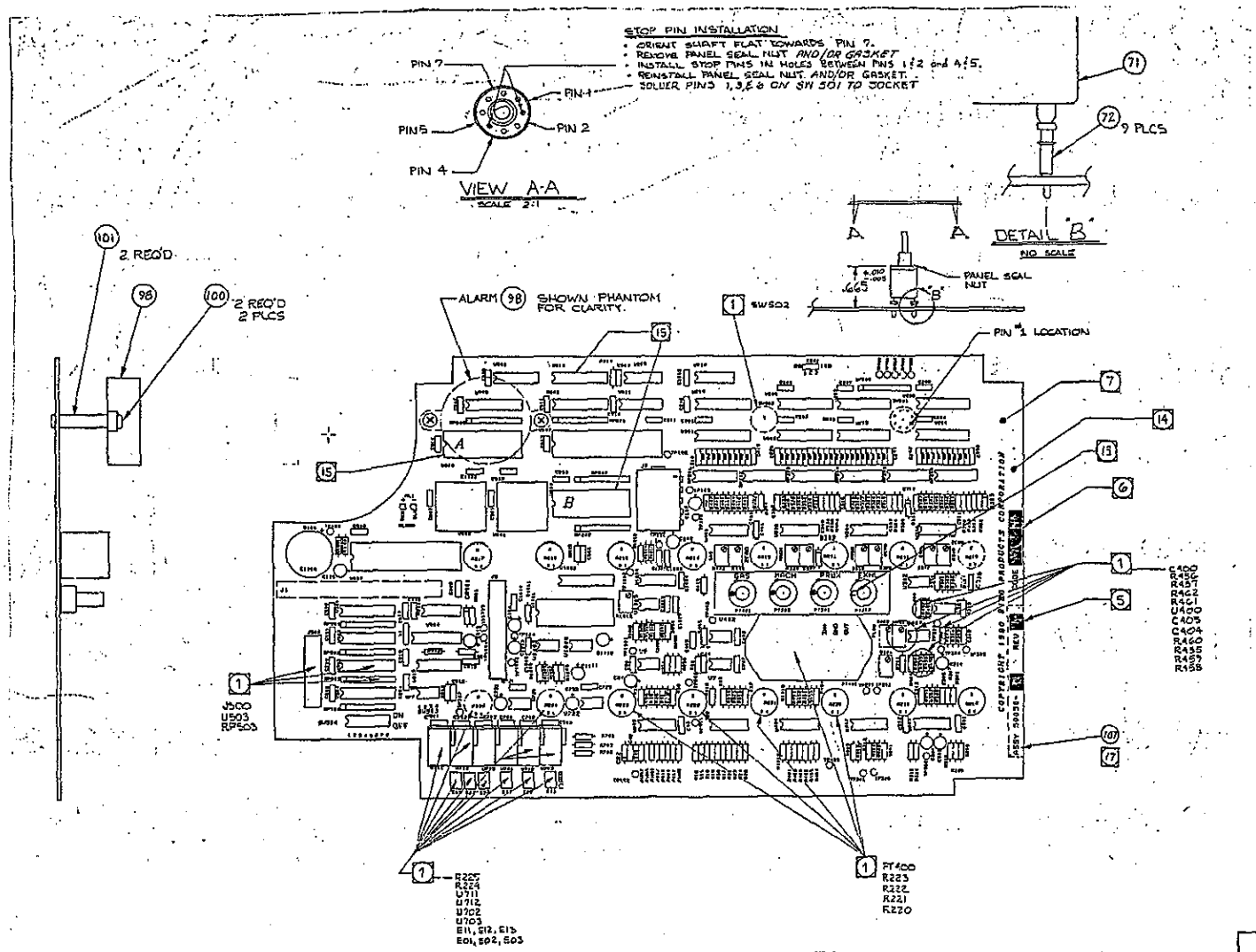
TITLE: PCBA, MAIN CPU FLOW SYNCH.

D | DWG NO. 50260E | REV 2

CRITICAL | ☒ COMPONENT | ☐ DEVICE | ☐ N/A



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SIZE	DWG NO.	REV
D	50260E	B

SCALE 1:1 | DO NOT SCALE DRAWING | SHEET 2 OF 2

Section 6.0
Parts List

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V.I.P. SECTION 6.0: PARTS LIST

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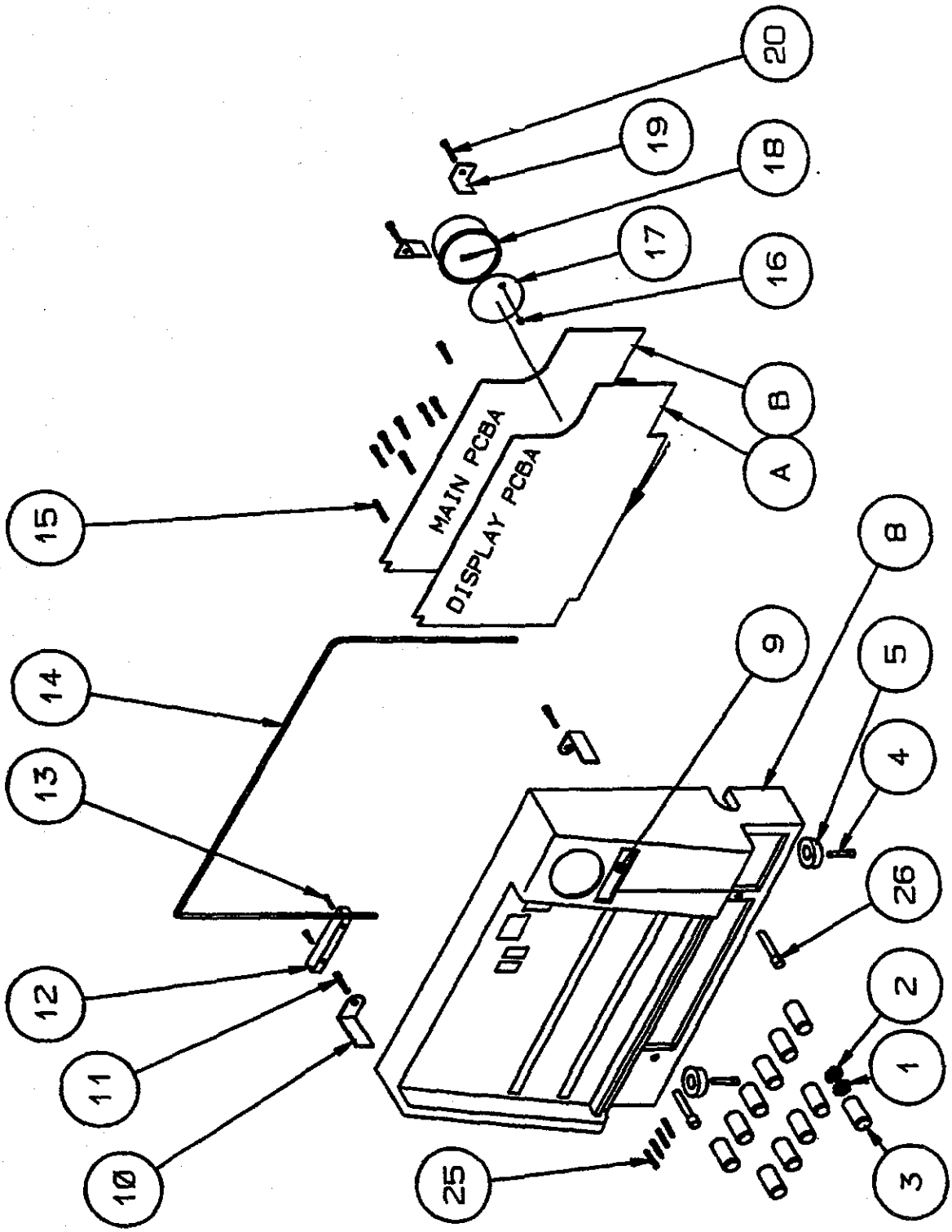
V.I.P. SECTION 6.0: PARTS LIST

6.1 PANEL, FRONT ASSEMBLY

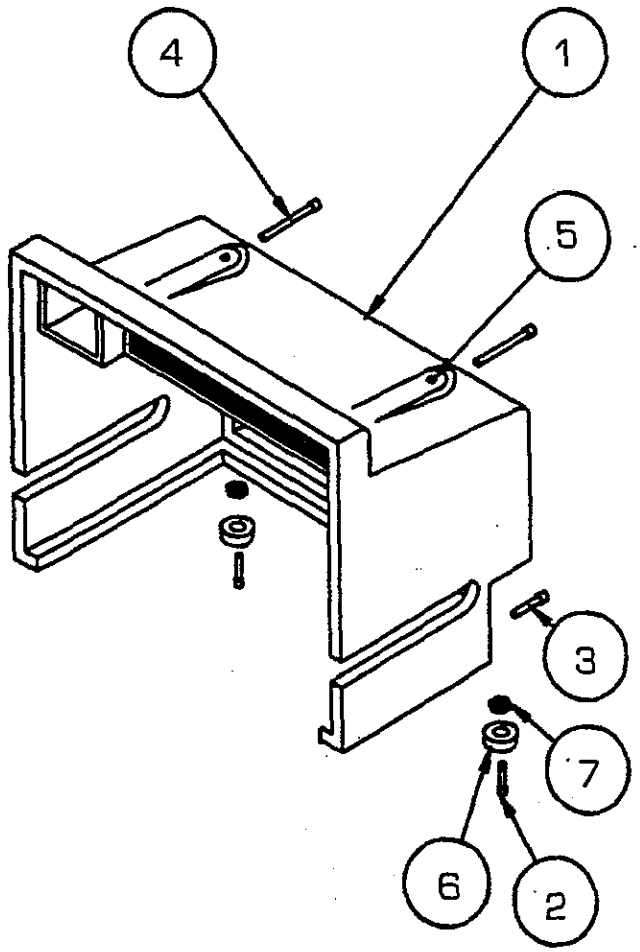


6.1 PANEL, FRONT ASSEMBLY – PARTS LIST

Item	P/N	Description	Qty
1	15008	Panel Front Assembly	1
2	03281	Nut, 1/4 - 32 X 0	11
3	20238	KNOB CONTROL	11
4	40008	Screw, 6 - 32 X .7	2
5	33524	Bumper, Rubber	2
6	20173	Pushrod, Switch	4
7	08833	Screw, 8 X 32 X .3	2
8	20120	Panel, Front Bezel	1
9	20202	Logo, BIRD V.I.P.	0
10	20160	Bracket, Hinge	2
11	03219	Screw, 6 - 32 X .3	4
12	20260	Bracket, Cover	1
13	40013	Screw, 6 - 32 X .375 HXCAP	2
14	33540	Gasket	
15	03221	Screw, 6 - 32 X .5	8
A	50040/50250	Display, PCBA	
B	50050/50260	Main, PCBA	
16	04876	Plug, Lens	1
17	09617	Lens, Bezel	1
18	09799	Manometer -20 TO + 40 CMH_2O	
19	09639	Bracket Gauge Mounting	2
20	03219	Screw, 8 - 32 X 1.38 HXCAP	2

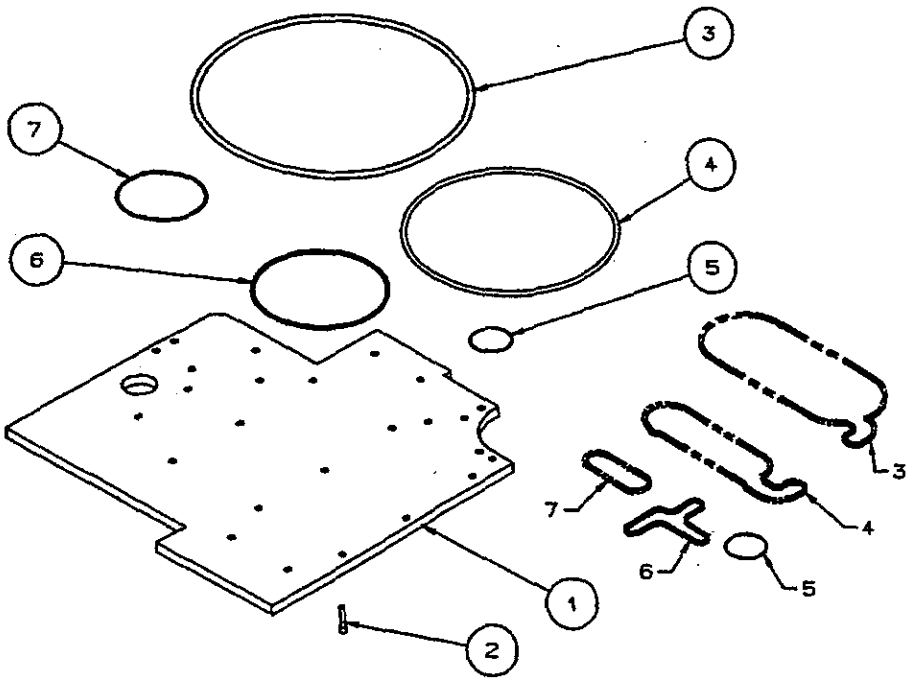
SECTION 6.0: PARTS LIST

6.2 TOP COVER ASSEMBLY



Item	P/N	Description	Qty
1	20122	Cover, Top	1
2	40008	Screw, 6 - 32 X .7	2
3	40011	Screw, 8 - 32 X .625 HXSCHD	2
4	03217	Screw, 8 - 32 X 1.375 HXCAP	2
5	03716	Plug, 187 DIA	2
6	33524	Bumper, Rubber	2
7	07566	Nut, 8 - 32 HEX	2

6.3 MANIFOLD BASE ASSEMBLY



Item	P/N	Description	Qty
1	20126	Plate, Sealing	1
2	40002	Screw, 10-32 X .50 SKHDCP	23
3	30001	O-Ring, 549 X .103	1
4	30002	O-Ring, 5.987 X .103	1
5	30003	O-Ring, 3.643 X .103	1
6	30004	O-Ring, 8.487 X .103	1
7	03021	O-Ring, 2.175 X .103 Topcap	1